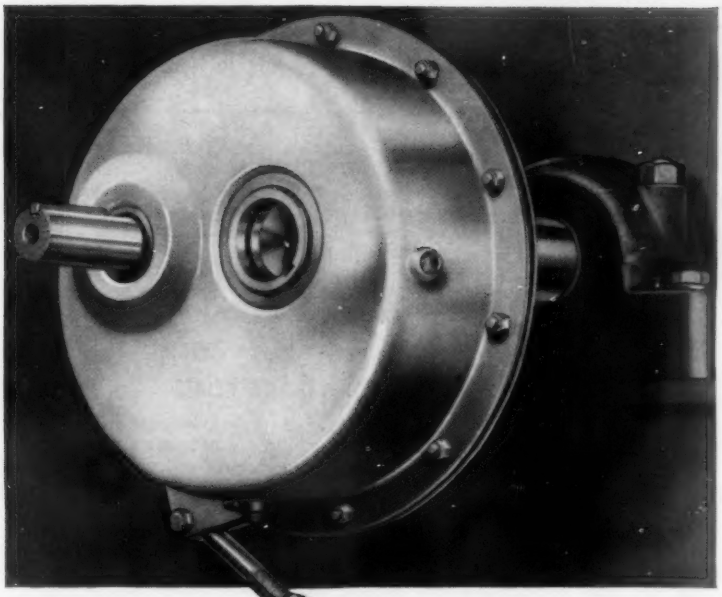


SIX SIZES

- 1/2 to 30 hp
- Single or double reduction
- Wide output speed range—420 to 10 rpm

FALK

ALL-STEEL

Shaft Mounted Drives—

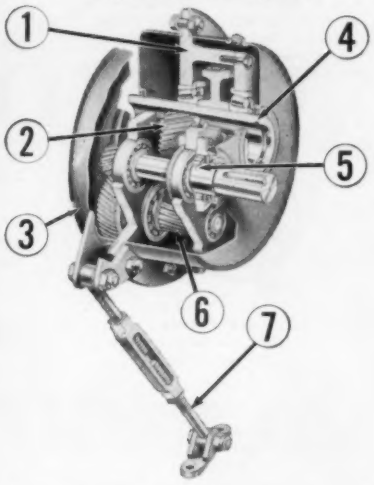
simple-compact-rugged-efficient

Created specifically for the vast number of applications demanding a sturdy and compact speed-reducing unit for direct mounting on the driven shaft, the new Falk all-steel Shaft Mounted Drive is built to give long service life at substantial savings of space, time, power and maintenance costs!

This efficient helical-gear drive, latest in the unmatched list of Falk precision-gearing achievements is an ingenious modification of the time-tested Falk Motoreducer design which has held, for more than 20 years, recognized leadership in this branch of highest-quality power transmission . . . It complements and completes the world-famous Falk line of reduction units covering the entire range of industrial applications.

Investigate the Falk all-steel Shaft Mounted Drive. Write to Department 247 for engineering bulletin, including selection and dimension details.

These famous FALK "In-built" factors *mean long life and dependability...*



1 **All-steel Frame,** with more than double the rigidity of iron, supports all rotating elements.

2 **Precision Helical Gears,** designed and machined by Falk, rated to AGMA standards.

3 **Pressed Steel Housings,** whose sole function is to keep oil in, dirt out; easily removed for gear inspection without dismounting unit.

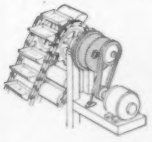
4 **Through Hollow Shaft** with counter bore provides for easiest installation or removal from driven machine shaft extensions.

5 **Backstop** can be furnished with the unit or added later for positive prevention of reverse rotation.

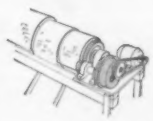
6 **Positive Lubrication,** continuous direct dip of revolving elements at all speeds.

7 **Tie Rod** and turnbuckle serve as anchor and facilitate V-belt or chain adjustment.

A FEW TYPICAL APPLICATIONS



BUCKET ELEVATOR



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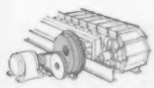
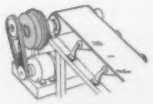


APRON FEEDER



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MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
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. . . a good name in industry

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Mr. Neu Gets a New Job

John C. Neu was recently named assistant to J. Arthur Powersox, director of engineering and maintenance for the National Brewing Co., Baltimore, Md.

Mr. Neu previously worked for seven years with the Bethlehem Steel Co. in the blast furnace mechanical department. He has a Bachelor of Engineering degree from Johns Hopkins University.

Expendable Pallets

DATA ON THE types of expendable pallets, construction standards for pallet parts and fastenings and allowable tolerances will be found in the technical pamphlet "What You Should Know About Expendable Pallets."

This publication is intended as a guide to pallet purchasers in determining the important principles involved in the construction and use of wooden expendable pallets. It also provides an Application Rule for the use of expendable pallets and a list of definitions and terms.

This publication is available from your pallet supplier or you can write to the National Wooden Pallet Manufacturers Association, 609 Barr Building, Washington 6, D. C.

Heat-Resistant Paints

DEVELOPMENT OF A ceramic frit, silicone resin type paint capable of withstanding temperatures up to 1400 F is described in a report of research by the Army Corp of Engineers.

The paint was needed by the Army to reduce the accelerated oxidation and rapid destruction of steel components which, under normal conditions of use, are heated to high temperatures in oxidizing atmospheres, such as mufflers and manifolds on automobiles.

Experimental investigations revealed that paints consisting of a blend of ce-

(Continued on page 4)

Dick Morris Begins Trip to Britain, Europe and Russia

Tom Hanson, editor of Plant Engineering, wishes Dick Morris a pleasant flight on the first leg of an extended trip that will take him to England, Scotland, Germany, France, Switzerland, Austria, Yugoslavia, Italy and Russia. In addition to attending the annual conference of the Incorporated Plant Engineers at Harrogate, England, Dick Morris will also attend the World Power Conference in Vienna and has scheduled a number of plant tours in the other countries

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of Address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

An engineering fact..

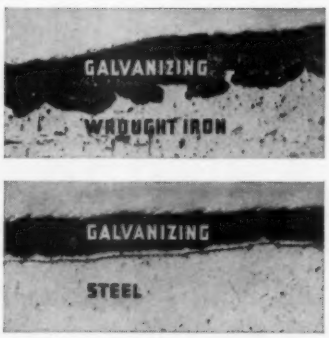
WROUGHT IRON PIPE takes up to a 50% heavier coating of ZINC

Tests prove the iron silicate fibers which give wrought iron its unusually high resistance to corrosion are also responsible for the material's ability to accept a considerably thicker hot-dip zinc protective coating than steel.

Our bulletin, *Piping for Permanence*, discusses galvanic protection, and reviews a variety of wrought iron pipe services. Write for your copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Division Offices in Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y.

Available in Canada and throughout the world



These photomicrographs illustrate the ability of wrought iron to receive a tighter, heavier zinc coating. Because the life of the coating is directly influenced by its adherence and weight or thickness, zinc coating on wrought iron lasts longer.

BYERS *Wrought Iron Tubular and Hot Rolled Products*

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

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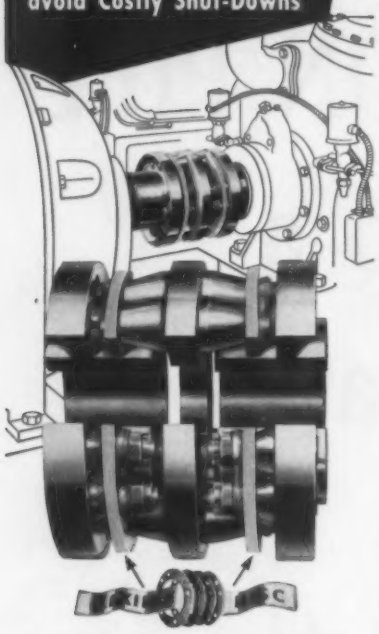
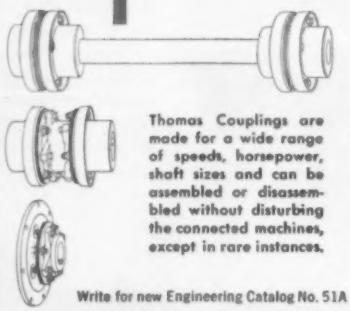
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

ramic frits, pigments, and refractories at a pigment volume concentration of 35 to 40 per cent, with a frit to pigment and refractory ratio of 3 to 1, withstood temperatures up to 1400 F without significant deterioration or loss of protective properties.

This report, PB 111957 Development of Heat-Resistant Paints, M. Kornbluth, Corps of Engineers, U. S. Army, may be ordered from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., price $4.00. It is dated February 1955 and contains 153 pages.

Appointment at Leece-Neville

Ellis B. Gitchell has been named Maintenance Superintendent of all plants of the Leece-Neville Co., Cleveland, Ohio.

He had served in a similar capacity with the American Greeting Card Co. before accepting his present appointment with Leece-Neville.

Chief Plant Engineer Duffy

William Duffy has been appointed chief plant engineer of Stokes Molded Products Division of The Electric Storage Battery Co.

He was formerly connected with the Glenn L. Martin Co., Baltimore, Md., as chief of building and field service. He also has been a partner in a machine shop business and a supervision project engineer of Johnson & Johnson, New Brunswick, N. J.

He is a registered professional engineer with licenses in several states. He graduated from Drexel Institute of Technology, Philadelphia, Pa., in 1943, with a degree in mechanical engineering.

We Did It Again!

We recently received word from Ned H. Dearborn, President, National Safety Council, that Plant Engneering had won the National Safety Council's Public Interest Award for 1955 along with a number of other specialized magazines.

This is the fifth time that Plant Engineering has received this award. We hope that we will continue to merit this honor.

Automation, Plastics Shows

Check your calendar if you plan to attend any of the conferences and clinics listed here.

The Seventh National Plastics Exposition will be held at New York City's new coliseum from June 11 to 15. A business and technical conference will run concurrently with the Exposition. Tentative plans call for technical sessions in the cellular plastics, automotive, packaging, building, refrigeration and air conditioning fields. This Exposition and Conference is sponsored by The Society of the Plastics Industry, Inc., New York.

The Eleventh Annual International Instrument-Automation Conference and Exhibit will be held in New York city from September 17 through September 21. The exhibits will be housed in New York's new Coliseum on 59th Street and Broadway. The technical sessions, clinics, workshops and special meetings, will take place in rooms of the Coliseum, Columbia University, and the Hotels Statler and New Yorker.

PM Program for Lift Trucks

Industrial trucks are one of the many pieces of equipment in an industrial plant that require preventive maintenance to keep them working efficiently.

To help industry with this job, The Towmotor Corp., Cleveland, Ohio, has

Industrial truck is given its 32 checkpoint service call by a trained mechanic

set up a Preventive Maintenance Program for servicing industrial trucks. The service program includes regularly scheduled calls at the plant where a check is made on 32 specific points. Complete written reports, given to the customer after each inspection, provide a permanent history of the condition of the equipment.

Weldability of Titanium

Effects of alloying elements on the weldability of titanium sheet are described in a report of research for the Air Force.

Through this study it was concluded that interstitial elements in titanium alloy weldments are harmful under some conditions. Where possible, limits of utility are described in the report.

This report, PB 121006, Study of Effects of Alloying Elements on the Weldability of Titanium Sheet, H. M. Myer, Armour Research Foundation for Wright Air Development Center, U. S. Air Force, may be obtained from Office of Technical Services, U. S. Dept. of Commerce, Washington, D. C., price $4.00.

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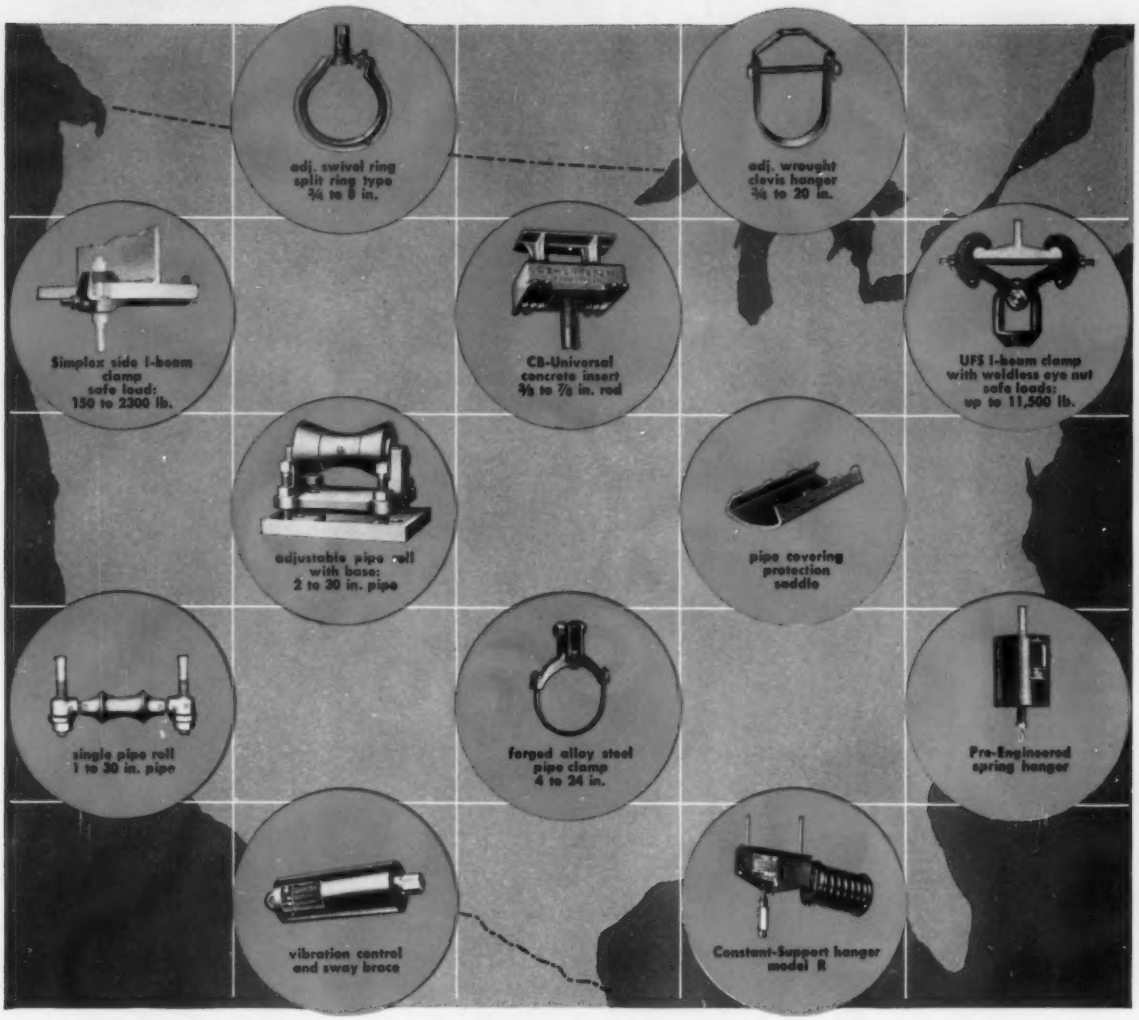
adj. swivel ring split ring type ¾ to 8 in.
adj. wrought clevis hanger ¾ to 20 in.
Simplex side I-beam clamp safe load: 150 to 2300 lb.
CB-Universal concrete insert ⅜ to ⅞ in. rod
UFS I-beam clamp with weldless eye nut safe loads: up to 11,500 lb.
adjustable pipe roll with base: 2 to 30 in. pipe
pipe covering protection saddle
single pipe roll 1 to 30 in. pipe
forged alloy steel pipe clamp 4 to 24 in.
Pre-Engineered spring hanger
vibration control and sway brace
Constant-Support hanger model B

the largest line, widest distribution, finest service in

PIPE HANGERS AND SUPPORTS, ANYWHERE!

Grinnell is America's No. 1 supplier of pipe hangers and supports. There is no other company, anywhere, which provides as thorough and complete distribution service; makes as complete a line; or can cooperate as fully with you on *all* your piping assignments..

Through Grinnell's coast-to-coast system of strategically located warehouses and jobbers, for example, you can purchase Grinnell Hangers out of stock, anywhere. Moreover, Grinnell, alone, of all manufacturers, maintains a staff of trained personnel that is ready to work with you "on the job", anywhere, in solving any problem connected with erection of pipe hangers and supports.

Profit by Grinnell's nationwide service, large-capacity manufacturing facilities, and practical knowledge gained during more than 100 years of service in the piping field. Next time, specify Grinnell Pipe Hangers.

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AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

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347 Local General Electric Distributors Announce . . .

"OFF-THE-SHELF" DELIVERY OF G-E

NOW—347 G-E motor Distributors throughout the country have increased their stocks to give motor buyers faster delivery of G-E Tri-Clad* '55' motors. They now carrry a complete line of Tri-Clad motors—listed at right—to keep your down time at a minimum and to help cut your standby inventory. Dial your local G-E Distributor today. His name and phone number are listed on the following pages. Call him now and he'll send you a handy Tel-Eze phone index—FREE.

*Registered trademark of General Electric Co.

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FREE GIFT! Call your local G-E motor Distributor to learn how you get faster delivery on Tri-Clad '55' motors 5 to 20 hp and larger. He'll also send you this handsome Tel-Eze phone index as a gift. Fasten it right to your phone. It's handy—useful—never in the way. (Supplies limited—call today.)

MOTORS 5 TO 20 HP

LISTED DISTRIBUTORS STOCK THESE MOTORS AND OTHERS IN SMALLER AND LARGER SIZES

HP	RPM	ENCLOSURE	HP	RPM	ENCLOSURE
5	1200	Dripproof	10	1800	Enclosed
5	1200	Enclosed	15	1800	Dripproof
7½	1800	Dripproof	15	1800	Enclosed
7½	1800	Enclosed	20	1800	Dripproof
10	1800	Dripproof	20	1800	Enclosed

All motors are standard, 60-cycle, 3-phase, Type K, ball-bearing models.

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4524
PUEBLO
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EVANSVILLE
General Elec. Supply Co.
T. J. Dornbusch, HA 5-2655
Graybar Elec. Co., Inc.
Jack Bauer, GR 6-1357
Swanson Nunn Elec. Co.
R. W. Lottes, HA 5-3321
FT. WAYNE
General Elec. Supply Co.
F. Rentschler, HA-3243
Nussbaum Elec. Co.
John Kinsey, AN-2252

HAMMOND
General Elec. Supply Co.
Lloyd Nettles, WE 1-5155
Graybar Elec. Co., Inc.
Andy Sarti, Tilden 4-7800
INDIANAPOLIS
General Electric Supply Co.
F. H. Townsend, ME 4-8443
Graybar Elec. Co., Inc.
M. P. Kirsch, ME 8-2351
SOUTH BEND
Koontz-Wagner Elec. Co., Inc.
H. B. Kumm, Central 3-8251

IOWA
BURLINGTON
Crescent Elec. Supply Co.
F. J. Hemann, PL 2-3631
CEDAR RAPIDS
Crescent Elec. Supply Co.
Leo Plotz, 3-9601
DAVENPORT
Crescent Elec. Supply Co.
George Mittman, 3-1811
Graybar Elec. Co., Inc.
R. J. Nelson, 3-2767
DES MOINES
Elec. Engrg. & Equip. Co.
L. E. Morse, AT 2-0431
General Elec. Supply Co.
C. B. (Barney) Peak, AT 8-7401
DUBUQUE
Crescent Elec. Supply Co.
Francis McDonough, 3-6411
WATERLOO
Crescent Elec. Supply Co.
James D. Martin, Adams 4-6866

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PITTSBURG
Atkinson Armature Works
Frank Horton, 1754
WICHITA
General Elec. Supply Co.
Jim Owens, AM 5-0627

KENTUCKY
HARLAN
General Elec. Supply Co.
Bud Thompson, 815
LEXINGTON
General Elec. Supply Co.
Paul E. Hines, 2-1887
Graybar Elec. Co., Inc.
L. W. Wester, 5-2020
LOTHAIR
Mine Service Co.
Phone 239
LOUISVILLE
General Elec. Supply Co.
Jack Mattingly, ME 7-3651
Graybar Elec. Co., Inc.
C. J. Honadle, Melrose 7-5411
Marine Elec. Company
Melvin Theobald, Juniper 4-7175

LOUISIANA
ALEXANDRIA
Brown Roberts Elec. Co.
Mack King, 3-7281
BATON ROUGE
General Elec. Supply Co.
G. F. Schilling, 7-7586
Graybar Elec. Co., Inc.
7-7586
NEW ORLEANS
General Elec. Supply Co.
Harvey Wager, Galvez 5771
Graybar Elec. Co.
John Palmer, Canal 6263
New Orleans Armature
John Berger, Canal 9566
Standard Supply & Hardware Co.
A. W. Herbert, CA 6641
SHREVEPORT
General Elec. Supply Co.
W. L. Smith, 4-1436
Graybar Electric Co., Inc.
J. L. Roberson, 5-3271

MAINE
PORTLAND
General Elec. Supply Co.
Harold French, Spruce 2-3721
WESTBROOK
Stultz Elec. Works
Robert Webb, UL 4-2501

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General Elec. Supply Co.
George Smorse, LE 9-3565
Graybar Elec. Co., Inc.
P. J. Curreri, SA 7-5050
HAGERSTOWN
General Elec. Supply Co.
A. L. Daly, 6216
Hagerstown Equip. Co.
Allen E. Ocker, 3813

MASSACHUSETTS
BOSTON
General Elec. Supply Co.
Carl Jackson, AL 4-5300
Graybar Elec. Co., Inc.
George Milligan, KE 6-4567
Sandman Elec. Co., Inc.
Robert L. Sandman, HI 2-7600
FITCHBURG
Service Elec. Supply Co., Inc.
George N. Bussiere, Jr., 3-4811
LOWELL
White Elec. Motors
Brent L. Smith, GL 8-6336
LYNN
Des Roberts Elec. Supply Co.
G. W. Knowlton, Lynn 5-0015
SPRINGFIELD
General Elec. Supply Co.
Errol Fournier, RE 4-8255
WORCESTER
General Elec. Supply Co.
Francis Cross, Pleasant 6-4351

MICHIGAN
BATTLE CREEK
Mid-States Elec. Supply Inc.
R. E. Hartmann, WO 3-6635
DETROIT
Frank C. Teal Elec. Co.
Victor L. Kochajda, LO 8-9092
General Electric Supply Co.
O. C. Hall, TR 5-9400
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TO 8-5550
Miller-Seldon Elec. Co.
T. E. Shreve, TY 4-3800
Spaulding Elec. Co.
A. P. Schaupner, WO 2-6200
FLINT
General Elec. Supply Co.
C. R. Hechinger, Sunset 9-9101
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R. E. Peacock, CE 2-4101
GRAND RAPIDS
Clement Elec. Distributing Co.
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General Elec. Supply Co.
D. A. Harper, Glandale 9-3243
Graybar Elec. Co., Inc.
GL 1-2701
JACKSON
Elec. Wholesale Supply Co.
P. Spry, 2-7123
KALAMAZOO
General Elec. Supply Co.
G. E. Herrington, 3-2645
LANSING
Barker-Fowler Elec. Co.
M. V. Green, IV 4-4406
General Elec. Supply Co.
J. H. Gallagher, Ivanhoe 7-5401
Graybar Elec. Co., Inc
M. Pratt, IV 7-5075
MUSKEGON
Fitzpatrick Electric Supply Co.
2-6621
SAGINAW
General Elec. Supply Co.
N. C. Stuart, 3-6474

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DULUTH
Graybar Elec. Co., Inc.
Arney Sabree, RA 2-6685
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Lakeland Engrg. Equip. Co.
Bob Borg, FE 8-7531
Sterling Elec. Co.
E. H. McQuire, FE 2-4571
ST. PAUL
General Elec. Supply Co.
R. Woods, MI 5-2761

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Power Elec. Co.
J. P. Hutchinson, 5-8361

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KANSAS CITY
General Elec. Supply Co.
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Graybar Elec. Co., Inc.
Wayne Aceto, JE 1-4700

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BILLINGS
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BUTTE
Graybar Elec. Co., Inc.
Dick Murtha, 3233

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Schneider Elec. & Equip. Co.
W. J. Andersen, Webster 5550

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RENO
Linnecke Elec. Sales Co.
W. R. Reynolds, Reno 3-3729

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MANCHESTER
General Elec. Supply Co.
Joe Charron, NA 5-5418

GENERAL ELECTRIC

SHELF" DELIVERY OF G-E MOTORS 5 TO 20 HP

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National Elec. Supply Co.
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General Elec. Supply Co.
Bill Lutton, BI 2-1600
Graybar Elec. Co., Inc.
H. Pearce, MA 2-5100
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A. Bishop Elec. Motor Exchange
Arnold Bishop, KI 5-6446
PATERSON
General Elec. Supply Co.
G. Weindling, LA 5-5100
Reliable Elec. Motor Repair Co.
Harold Muller, AR 4-7756
Watson-Flagg Sales Corp.
E. M. Koetsier, LA 5-2324
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General Elec. Supply Co.
Ray Jamieson, Owen 5-3453
Thropp Elec. Sales Corp.
C. W. Archinal, JU 7-1441

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Electric Service, Inc.
2-9447
General Elec. Supply Corp.
2-5246

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Graybar Electric Co., Inc.
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Havens Electric Co., Inc.
4-1201
BUFFALO
General Electric Supply Co.
E. H. Sheldon, EL-5100
Graybar Electric Co., Inc.
Lou Pfeffer, WA-3700
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Apparatus Distributor, Inc.
Len Keller, UL 2-4000
ELMIRA
Le Valley McLeod, Inc.
John F. Decker, 6163
GLENS FALLS
Glens Falls Electric Supply Co., Inc.
2-5868
JAMAICA
Central Queens Elec. Supply Corp.
Charles Weltner, RE 9-2020
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Graybar Elec. Co., Inc.
L. H. Kort, EX 2-2000
Motors & Armatures, Inc.
Sid Davis, EX 2-3523
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Electric Motors Corp.
M. Goldberg, CA 6-4665
General Elec. Supply Co.
Jim Boyland, AL 5-3300
W. W. Grainger, Inc.
E. Heckler, CA 6-3810
Hudson Elec. Sales Co., Inc.
D. Hark, WO 2-3041
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Electra Supply Co., Inc.
Howard K. Phillips, 8000
ROCHESTER
Electric Equip. Co. Div.
Norry Elec. Company
GL-6070
General Elec. Supply Co.
Dan Nolan, HA 7500
T. H. Green Electric Co.
HA-9840
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M. H. Salmon Elec. Co., Inc.
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Tri-State Elec. Motors, Inc.
D. W. Fitzpatrick, Ashley 2-4250
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C. A. Dyer, 4-3154
Mather, Evans & Diehl Co., Inc.
Bill Diehl, 4-6165

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Armature Winding Co.
J. E. Jenkins, ED 3-2158
General Elec. Supply Co.
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GREENVILLE
General Elec. Supply Co.
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CANTON
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Jackson-Bayley Electric Co.
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Graybar Elec. Co., Inc.
MA 1-0600
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General Elec. Supply Co.
Len Burns, HE 1-7280
Graybar Electric Co., Inc.
G. W. MacCarter, HE 2-2500
Strong, Carlisle & Hammond Co.
Jim Simmons, TO 1-8800
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Graybar Electric Co., Inc.
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The Loeb Electric Co.
Marion Klocki, AX 9-1142
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MI 0781
Graybar Elec. Co., Inc.
MI 5665
HAMILTON
The Wente Elec. Co.
TW 4-8128
PORTSMOUTH
General Elec. Supply Co.
3-2341
TOLEDO
General Elec. Supply Co.
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Graybar Elec. Co., Inc.
Al Katafiasz, EX-1641
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Economy Electric
E. Cutler, Jr., Riverside 4-4461
General Electric Supply Co.
C. B. Monroe, Riverside 6-6511
Graybar Elec. Co., Inc.
George Rowlands, Riverside 4-0124

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DUKE
I. V. Owen Co.
Ronald Owen, 72
OKLAHOMA CITY
Graybar Elec. Co., Inc.
Jim Cavanaugh, FO 5-9351
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General Electric Supply Co.
F. G. Ross, DI 3-6121
Graybar Elec. Co.
Ray Downing, MA 6-2121
WEWOKA
Okla. Ind. Elec. Supply Co.
Jim Embach, 287

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COOS BAY
Marshfield Elec. Co.
U. E. Richter, Congress 7-6319
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American Steel & Supply Co.
R. E. Yates, Diamond 5-0373
KLAMATH FALLS
Klamath Mach. Co.
H. Ellis, 2-2588
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American Steel & Supply, Inc.
R. S. Rix, 2-7181
General Elec. Supply Co.
P. Jorgenson, 3-4519
PORTLAND
Eoff Electric Co.
CA 2-9411
General Elec. Supply Co.
CA 7-0651
Graybar Elec. Co., Inc.
CA 7-6641
Holt & O'Donnell
CA 8-0753
ROSEBURG
Industrial Elec. Service Co.
L. Hobart, OR 3-6658

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Allen Elec. Co.
L. Brown, HE 5-9515
General Electric Supply Co.
Bob Harte, Hemlock 3-5206
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Bovaird & Co.
L. V. Brown, 7141
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General Elec. Supply Co.
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ERIE
General Elec. Supply Co.
Al Weirich, 2-1477

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5-5655
JOHNSTOWN
General Elec. Supply Co.
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Raub Supply Co.
G. E. Brown, 7-6221
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A. J. Lacourse
Eugene Batdorf, MA 7-1895
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Graybar Elec. Co., Inc.
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Jos. T. Fewkes & Co.
Ray Gillin, WA 2-2241
PITTSBURGH
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D. J. Finn, Fairfax 2-1530
Graybar Elec. Co., Inc.
Mark Glasgow, FA 2-4100
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Bill Rodgers, Reading 4-2169
SCRANTON
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H. McDowell, Diamond 4-8563
Scranton Elec. Construction Co.
A. W. Winter, DI 2-3152
SHARPSBURG
Globe Elec. Repair Co.
Steve Marshall, Sterling 1-2677
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Westchester Elec. Supply Co.
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WILLIAMSPORT
Lowry Electric Co., Inc.
P. M. Griffin, 2-7841
WILKES-BARRE
General Elec. Supply Co.
H. G. Holland, Valley 2-5106

RHODE ISLAND
PROVIDENCE
General Elec. Supply Co.
W. L. Higgins, GA 1-6522
J & H Electric Co.
Calvin Wilcox, GA 1-7840
PAWTUCKET
N. E. Elec. Supply Co.
Pawtuckett 5-7400

SOUTH CAROLINA
ANDERSON
Woodward-Stephens Co., Inc.
D. Fred Stephens, CAnal 5-2501
GREENVILLE
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Newell Eastland, 2-2421
SUMTER
Sumter Machinery Co.
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McLaughlin Elec. Supply House
Don Lehr, 4911
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Crescent Elec. Supply Co.
T. R. Hersey, FI 2-7913

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Elec. Motor Sales & Supply Co.
Frank N. Griscom, Jr., 9-7361
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Max Evans, 4-3351
COLUMBIA
Middle Tenn. Armature Wks.
R. Cleveland, EV 8-3672
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Graybar Elec. Co., Inc.
Jim Branson, BR 8-7150
Tri-State Armature & Elec. Wks.
W. W. Bumpus, JA 7-8414
NASHVILLE
Industrial Sales Co., Inc.
N. G. Welch, ALpine 4-3508
Nashville Armature Co.
ALpine 6-2546

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ABILENE
General Elec. Supply Corp.
Ray Alexander, 2-2827
Graybar Elec. Co., Inc.
Buck Buchanan, 2-2861
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General Elec. Supply Co.
B. D. Garrett, DR 6-7254
Graybar Electric Co., Inc.
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BEAUMONT
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Arlan Young, 4-6435
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Bradley Motor & Armature Works
Ernest B. Williamson, TU 2-8891
General Elec. Supply Co.
W. D. Clarke, TU 2-9237
Graybar Elec. Co., Inc.
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DALLAS
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Graybar Elec. Co., Inc.
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W. M. Smith Elec. Co.
Gene Jackson, Hamilton 8-4606
EL PASO
General Elec. Supply Co.
Joe Caldwell, 3-3407
Graybar Elec. Co., Inc.
H. Chaparro, 3-7561
FT. WORTH
General Elec. Supply Co.
Paul Huntley, ED 2-5385
Graybar Elec. Co., Inc.
Bill Hart, ED 5-4523
HOUSTON
Buffalo Elec. Co.
Chuck, Sonny, or Andy, CA 8-4431
General Elec. Supply Co.
T. W. Haley, SA 3-3121
Graybar Elec. Co., Inc.
Tom Keen, CA 8-4571
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GENERAL ELECTRIC

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San Antonio Machine & Supply Co.
S. V. Patrick, CA 5-1651
General Elec. Supply Co.
J. A. Russell, CA 7-1261
TYLER
General Elec. Supply Co.
R. A. Hamilton, 2-1674
WACO
General Elec. Supply Co.
Henry L. Fleischhauer, 2-1611
WICHITA FALLS
Elec. Motor Co.
Eugene Phillips, 7-7841

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SALT LAKE CITY
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EM 3-3911
Graybar Elec. Co. Inc.
Elgin 9-8771
Refrigeration Distributors Corp.
DA 2-5886

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Electrical Equip. Co.
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General Elec. Supply Co.
W. E. Sheppard, MA 2-7183
ROANOKE
General Elec. Supply Co.
J. W. Hughes, 3-1564
Graves-Humphreys Hdw. Co., Inc.
R. W. Eldridge, 3-8011
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W. C. John, 3-3615

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H. J. Halvorsen, SE 6400
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Shields, Harper & Co.
S. Klinefelter, EL-2674
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Graybar Elec. Co., Inc.
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TACOMA
General Elec. Supply Co.
Dean Elton, BR 8454

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Bluefield Supply Co.
W. E. McDougle, DA 5-6131
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Virginian Electric, Inc.
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HUNTINGTON
Virginian Electric, Inc.
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Logan Hardware & Supply Co.
J. E. Surndell, 710
WHEELING
General Elec. Supply Co.
R. L. Nickerson, 2555

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APPLETON
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Beemster Elec. Co.
H. N. Beemster, HE 7-3238
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Elec. Motor Service
C. Sutherland, AL 6-6724
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L. E. (Bud) Tapp, Broadway 6-7730
Graybar Elec. Co., Inc.
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WAUSAU
Snapp Elec. Supply Co.
R. C. Runquist, 2-1031

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CASPER
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K. R. Brown, 2-7333
CHEYENNE
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HONOLULU
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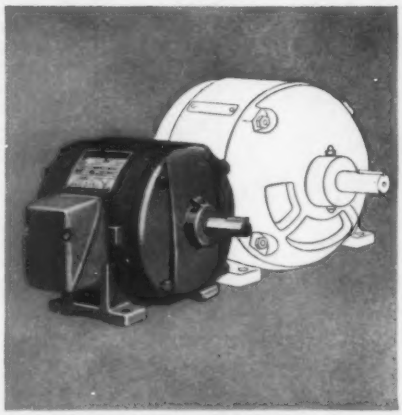

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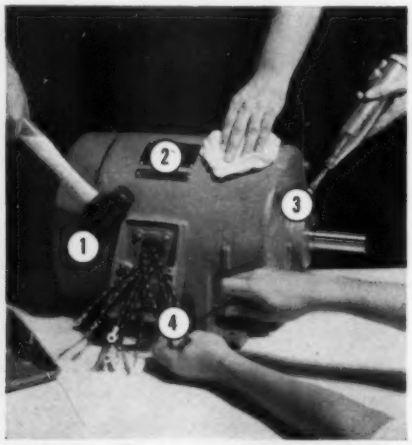

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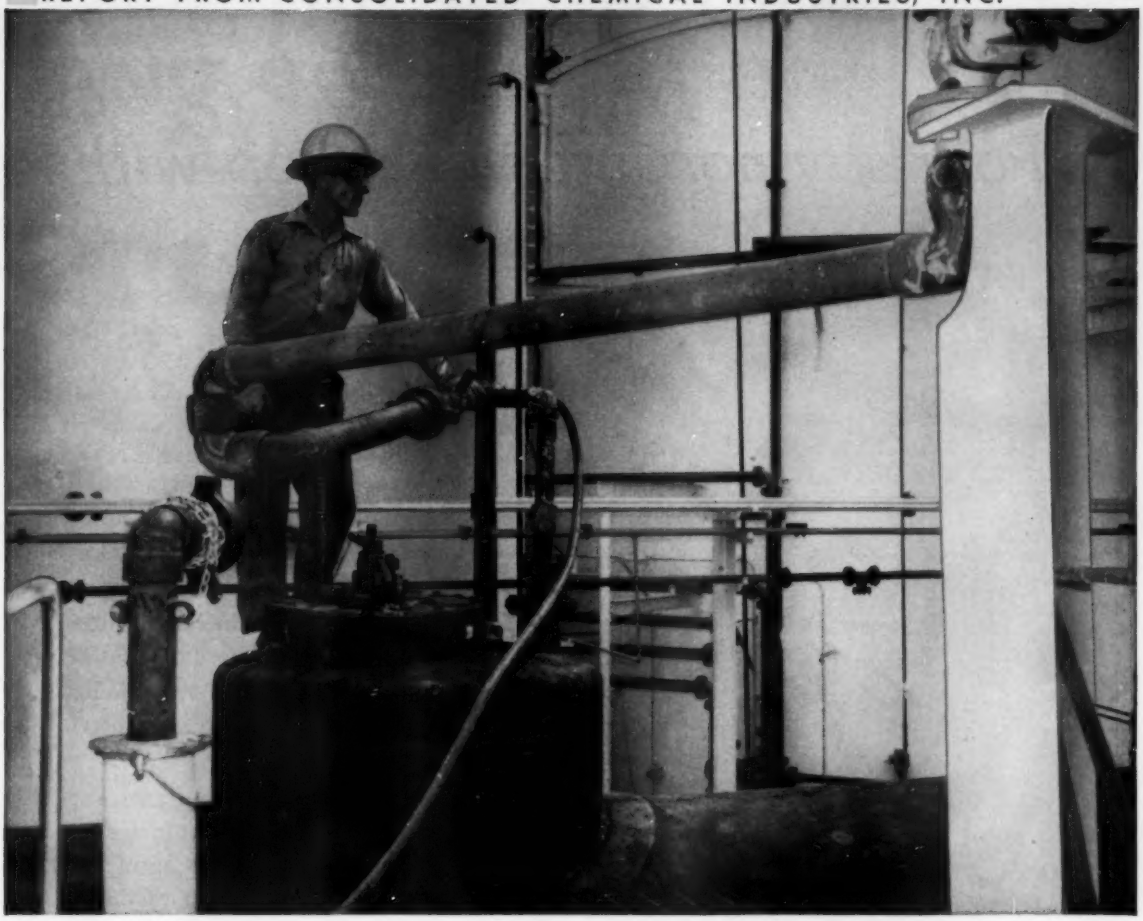

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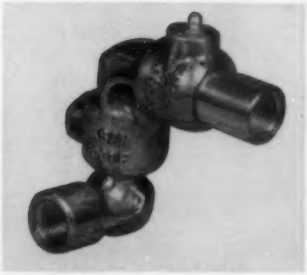

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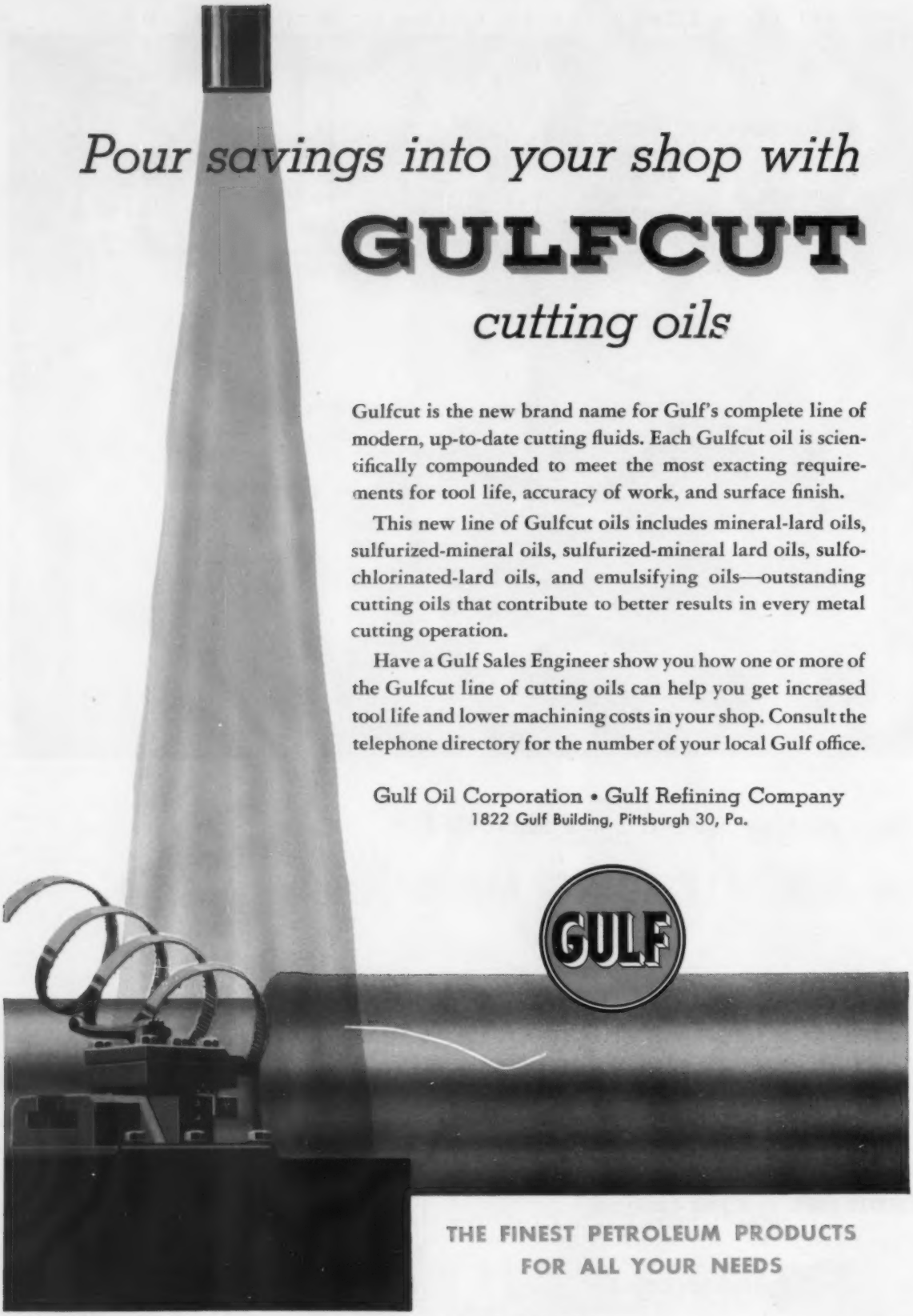

THE FINEST PETROLEUM PRODUCTS
FOR ALL YOUR NEEDS

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MODERN OIL AND GAS FIRED BOILERS

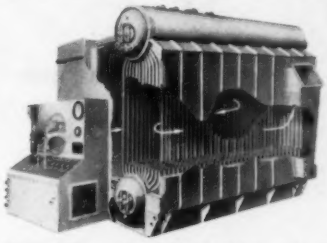
The boilers illustrated here cover the broad capacity range from 4,000 to 600,000 lb of steam per hr. They are all especially designed for gas and/or oil firing. The two units illustrated at right (Types VP and VU-55) are standardized and each is available in several sizes. The capacity range covered by these two units is from 4,000 to 120,000 lb per hr. The two units below are custom designed for various capacity, pressure and temperature requirements up to 600,000 lb per hr, 1400 psi and 950 F. All these units are pressure fired and do not require induced draft fans.

Collectively, they offer an exceptional diversity of choice. A brief consideration of the features of each type will help you "pinpoint" the design characteristics best suited to your particular needs.

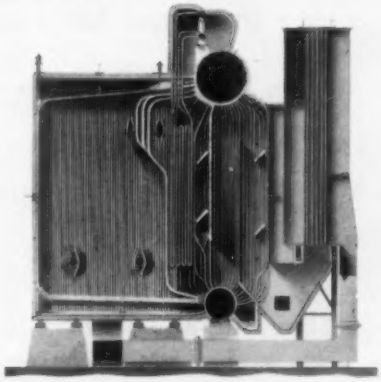
Of course there are other C-E two drum Vertical-Unit Boilers available for pressures up to 1400 psi and temperatures up to 960 F. Shown here are but four popular members of the C-E family of Vertical-Unit Boilers—a family which has achieved a wide measure of acceptance using all types of fuel.

Please feel free to call on us for further detailed information. Catalogs are available upon request.

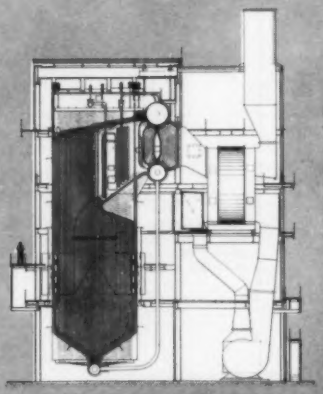
B-922-A



C-E Package Boiler — Type VP Completely shop assembled . . . available in fourteen sizes from 4,000 to 40,000 lb capacity . . . pressures to 500 psi. Available with integral console control panel, this unit contains more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. It can be equipped with any of several approved burners.

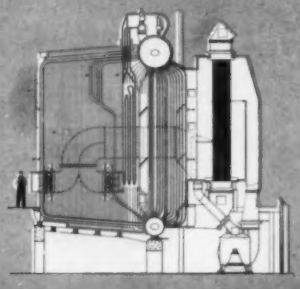


C-E Vertical Unit Boiler — Type VU-55 Available in six sizes . . . capacities from 50,000 to 120,000 lb steam per hour . . . designed for two pressure ranges, 250 psi and 500 psi, and total steam temperatures up to 750 F. This double cased, gas-tight unit is equipped with tangential burners. A large (60-inch) steam drum assures generous water capacity and steam reservoir space. Tangent tube waterwalls offer complete furnace protection, minimizing maintenance.



C-E Vertical Unit Boiler — Type V2

This unit is available for capacities from 200,000 to 600,000 lb per hr. It can be designed for pressures up to 1400 psi and for temperatures to 950 F. Tilting tangential burners, providing superheat control, are standard equipment although horizontal burners are available, if desired. A double, gas-tight casing assures lifetime tightness and minimum heat loss. Heat recovery equipment can be furnished as desired.



C-E Vertical Unit Boiler — Type VU-50S

This unit is available for capacities from 50,000 to 400,000 lb per hr—pressures to 1400 psi and temperatures to 950 F. This bottom-supported design uses tilting tangential burners providing effective superheat control. Horizontal burners can be furnished if desired. Heat recovery equipment as required. This unit makes available to industrial installations a standard of performance comparable to utility practice.

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BIG ENOUGH to offer one of the most complete lines in the industry, and a nation-wide service organization second to none.

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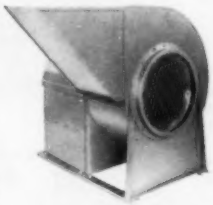
Available in 18 sizes, designed for ceiling suspension and also to use either steam or hot water. Quiet operation; compact design. Catalog No. 700.

INDUSTRIAL HEATER

Replaces exhausted air, balances minus pressures. Big capacity—does the job of many smaller, propeller-type units. Catalog No. 750.



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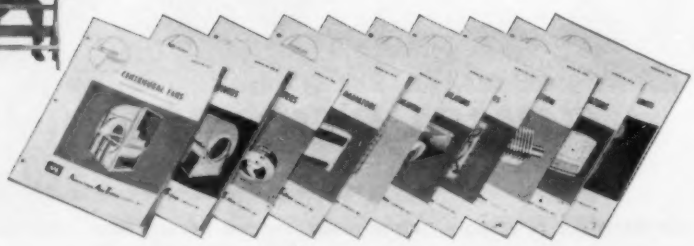
Years-ahead features in new "packaged" Unit Blowers. Compact, space-saving, easy to service. Wide range of unit sizes. Catalog No. 826.

A wealth of useful data now ready for you in the NEW HERMAN NELSON Catalogs

New, modern format . . . easy-to-read engineering catalogs that are the finest in the industry are yours for the asking. Request catalogs you need on your business letterhead. Address American Air Filter Co., Inc., 228 Central Ave., Louisville 8, Ky.



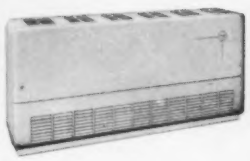
Heating and Ventilating Products

VERTICAL UNIT HEATER

For high ceiling installations. Discharges air vertically downward or at angle to vertical in various directions. Steam or hot water. Catalog No. 700.

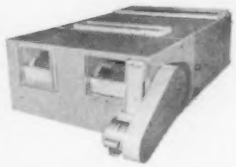
GAS-FIRED UNIT HEATER

Job-rated for stores, lobbies, studios, warehouses, offices, salesrooms—*all* efficient heating. Available in seven different sizes. Catalog No. 715.



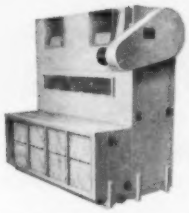
CONSOLE HEATER

16 models—64 air inlet-outlet arrangements. Fully-recessed, semi-recessed or free-standing applications. Smartly designed. Catalog No. 727.



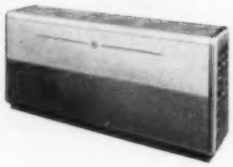
HEATING & VENTILATING UNIT

Hangs on ceiling, out of the way, or mounts on wall or floor. Quiet operation, slow speed, with completely rotatable fan sections. Catalog No. 775.



AIR CONDITIONING UNIT

New type air-conditioning units for low cost commercial and industrial applications. Delivers up to 15,000 cu. ft. clean, cooled air per minute. Catalog No. 785.



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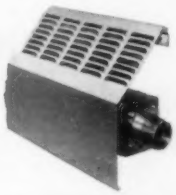
Functional, trim, clean lines—the modern version of the unit classroom heater and ventilator. Efficient, functional in design, attractive. Catalog No. 3500.

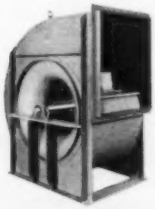
CONVECTOR

Free standing or semi-recessed models in 4 depths and 3 or 4 heights. Can be furnished with dampers. Steam or hot water. Catalog No. 791.



FINNED RADIATION

Available either with steel fins on steel tubing or aluminum fins on copper tubing. Light-weight, suitable for exposed or concealed installation. Catalog No. 790.



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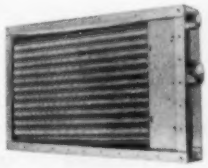
Available in either slow speed or non-overloading types; 17 wheel diameters from 12¼" to 73"; 8 arrangements for direct or belt drive. Catalog No. 850.

INDUSTRIAL EXHAUSTER

Exclusive hub assembly cuts maintenance & replacement costs. New impeller design; heavy duty shaft & bearings. Catalog No. 860.

PROPELLER FAN

Operates horizontally or vertically; belt or direct drive. Wide range of sizes in both types. Capacities to 36,150 CFM. Low operating cost. Catalog No. 800.



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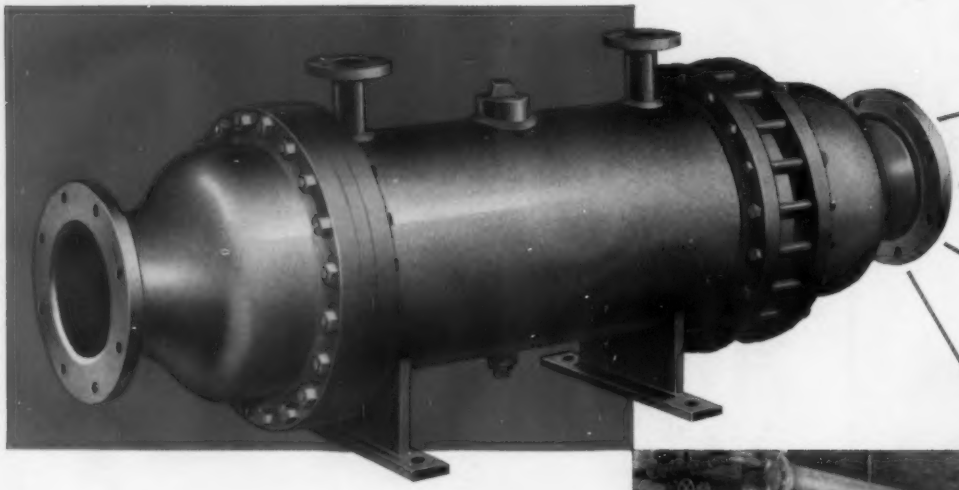


efficient design

special features

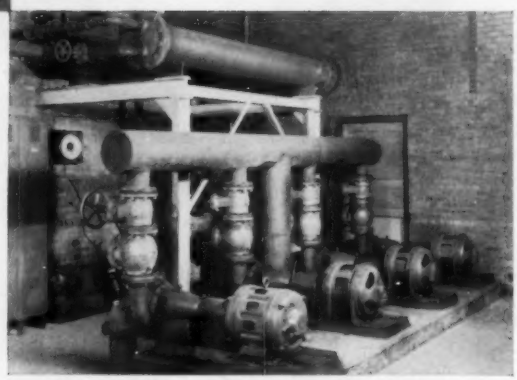
precision workmanship

correct selection and handling of materials

Why **B & G**

Heat Exchangers

give the service you expect



Installation of B&G Heat Exchangers and Centrifugal Pumps.

Whether you need an off-the-shelf or a custom-built unit, B&G offers quality and performance perfected in a quarter century of manufacturing heat exchange equipment.

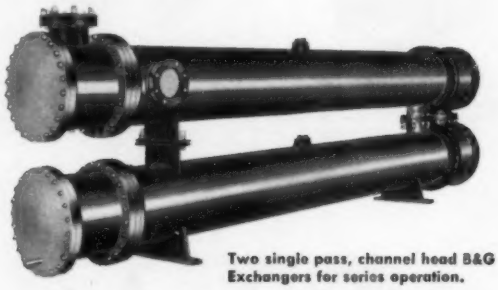
Starting with proper selection and handling of materials, B&G Exchangers are built to designs of proved efficiency and with uncompromising workmanship. Ample material thicknesses in every detail and high tensile strength bolting are assurance of strength and long operating life. Full tube bundles and close tolerances between shell wall and baffles prevent slippage of fluid and assure maximum heat transfer. Units can be furnished with tubing of copper, steel, several of the stainless steels and other non-ferrous alloys.

B&G Heat Exchangers are built to ASME Code U-69 requirements and can be certified by Hartford Steam Boiler and Inspection Service.

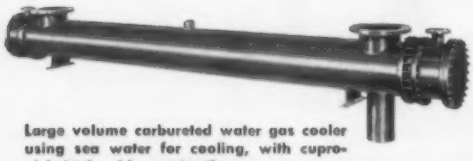
The B&G engineering staff is always available for consultation on your heat exchange problems. Send for catalog showing application range of B&G Heat Exchangers.

STANDARD DESIGNS OR ENGINEERED TO YOUR REQUIREMENTS

High pressure B&G Exchanger with fixed tube sheets and expansion joint design.



Two single pass, channel head B&G Exchangers for series operation.



Large volume carbureted water gas cooler using sea water for cooling, with cupro-nickel tube-side construction.

BELL & GOSSETT

COMPANY

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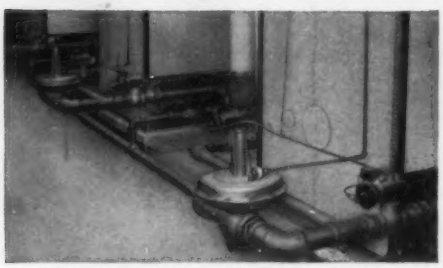
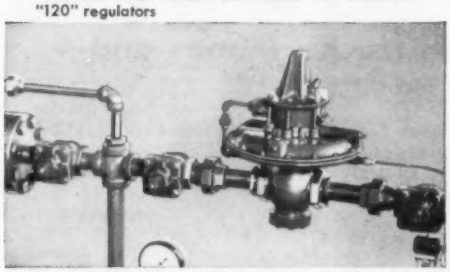
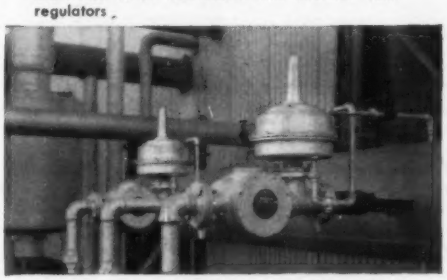
For All Industrial Heating Purposes



FURNACE AND BOILER CONTROLS with Rockwell "120" regulators



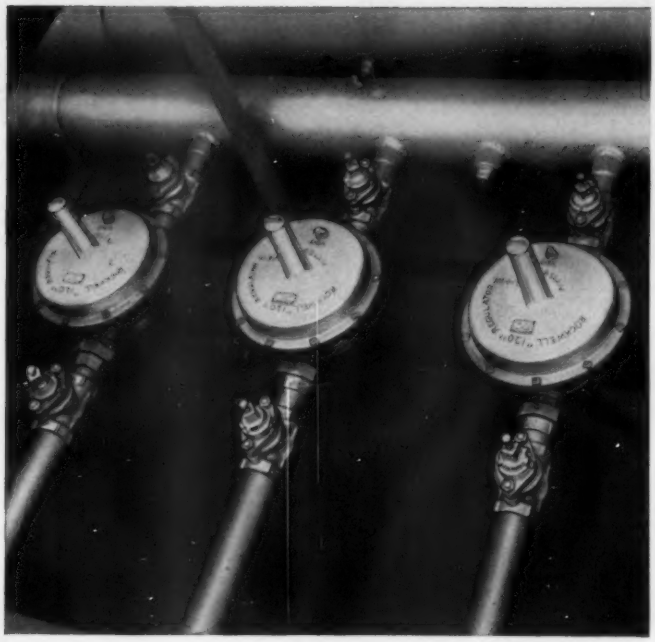
KILN AND OVEN CONTROLS with Rockwell "1001" regulators



GAS ENGINE CONTROLS with Rockwell "014" regulators

ROCKWELL *Gas Pressure* REGULATORS

A SIZE AND TYPE FOR EVERY NEED



Let Rockwell Gas Pressure Regulators **Improve Your Combustion Control**

No matter what the process when you use gas for heat or power, you need *good pressure regulation* to obtain *good combustion*. A constant, even pressure at the burners means uniform quality in your end products . . . and maximum fuel economy, too.

Rockwell makes a complete line of regulators for either high or low pressure burner control. Among them is the right type and size for any specific application. To help solve your problems in combustion control we invite you to make full use of our field engineering service. Use the handy coupon or write fully today.

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Company_____

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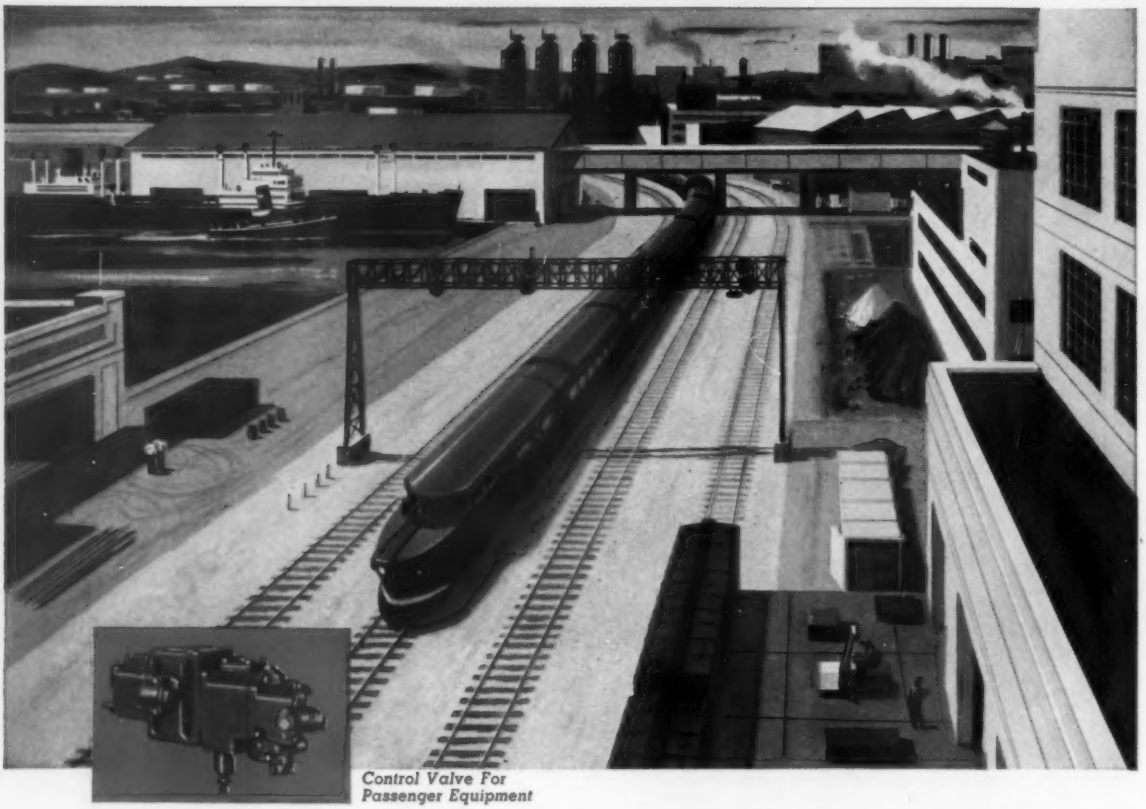

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HYDRECO Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi. DUDCO Duel-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation.

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Railroad air brake equipment of all types, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

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The ever-increasing demand for greater tonnage, higher speeds, finer appointments and assured safety for moving people and products brings into high focus the things that make such progress possible.

The modern freight train and tomorrow's sleek streamliners are advances in which the engineering of The New York Air Brake Company plays an important role. Precision engineering, plus craftsmanship, plus pneumatics "know-how" makes fingertip control for positive, velvet-smooth braking a reality on America's railroads.

For today's jet air liners The New York Air Brake Company builds STRATOPOWER Hydraulic Pumps. These Pumps have the watch-like precision to provide dependable Fluid Power for operating control surfaces and performing many other important functions on civilian and military aircraft, rockets and guided missiles.

Passenger ships, freighters and tankers, although larger and speedier than ships of yesteryear, load and discharge cargoes quicker and maneuver more alertly. DUDCO and HYDRECO Fluid Power equipment brings simplicity, ease, speed and safety to steering, raising and lowering hatches, powering winches and cargo booms and other shipboard functions. Ashore, these same components operate lift trucks and conveyors. You'll also find AURORA and KINNEY Liquid Handling Pumps . . . AURORA Pumps for fire fighting, boiler feed and water systems . . . KINNEY Pumps for transfer of bunker fuel, asphalt, molasses, crude oil and gasoline.

KINNEY High Vacuum Pumps contribute much to modern transportation. High Vacuum technology is the magic ingredient in the manufacture of Radar, Electronic and Electrical devices, Refrigeration, Air Conditioning and the practical application of Atomic power.

Look to The New York Air Brake Company for progress and the engineering that serves both you and your products.

Write for full information on new developments in Hydraulic, Liquid Handling and Vacuum equipment.

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INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

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BULLETINS just released and of immediate plant interest

LIGHTING

101 Industrial Lighting Units—The 36-pp 1956 Edition of the RLM Standard Specifications for industrial lighting units contains important revisions in specifications on both incandescent and fluorescent industrial lighting units, as well as new lighting data of special value to specifiers. Most important of the changes and additions are new coefficient of utilization tables for eight incandescent and fluorescent lighting units. Calculations are based on latest Zonal Method of computing coefficients of utilization and illumination on room surfaces. Also included are revised light distribution curves on RLM fluorescent lighting units. RLM Standards Institute, Inc.

102 Mercury Vapor Lighting—"Better Industrial Lighting with Mercury Vapor," 12 pp, gives eight reasons why industrial plants have switched to mercury vapor lighting. Special features of company's own lamps are described. Use of color-improved mercury vapor lamps and of clear mercury vapor lamps in combination with other lighting to meet special color requirements is also treated. Booklet also provides technical data and operating characteristics on the lamps, some facts on cost, and engineering hints for effective installation. Sylvania Electric Products Inc.

CONSTRUCTION

103 Architectural Products—Metal curtain wall panels and 10- and 12-in. joists are among new products listed in this 24-pp catalog. Also presented are company's full line of Stran-Steel architectural products, including joists, studs, channels, columns and beans, and galvanized ribbed decking. Fully illustrated, catalog contains dimensional date, installation details, application information and design examples. Stran-Steel Corp.

104 Curtain Wall Installation—Short form specifications and erection procedures for field-assembled insulated metal curtain and single corrugated metal roofing and siding sheets, installed with the Setlok fastener are included in two application data bulletins, Nos. 421 and 421.1. Nelson Stud Welding Div., Gregory Industries, Inc.

105 Industrial Floors—Bulletin 3-3 explains in detail two standard corrosion-resistant industrial floors. Complete estimating data is available with a thorough explanation of the differences in construction for both types of floors. Atlas Mineral Products Co.

106 Floor Surface Hardener—Bulletin SH56 describes preparation of Emeri-Topcrete, a hard surface flooring made with company's Type SH Cortland Emery aggregate. Includes recommended specifications and estimating data. Materials, mixing, application and curing information is given. Walter Maguire Co., Inc.

107 Doors for Industry — Illustrated with pictures of six installations, this 8-pp catalog provides up-to-date facts, figures and planning data on developments in industrial doors. Features description of industrial vertical lift doors, industrial turnover doors, vertical lift pier doors and crane doors. Charts, specifications and operational data included, as well as selection guide. Marketing Services Div., International Steel Co.

PUMPS, COMPRESSORS

108 Packaged Pumps—Easy stocking, ordering, storing and application are advantages of company's end-suction packaging plan described in 8-pp Bulletin B-2319. It contains complete pump descriptions and a selection chart, as well as head-capacity performance curves for 22 pumps. Peerless Pump Div., Food Machinery and Chemical Corp.

109 High Temp Pumps—Bulletin 1040 describes and illustrates construction and operation of high temperature Series T canned motor Chempumps. Full details on performance, materials of construction, dimensions, power requirements are given. Chempump Corp.

110 Solids Handling—Bulletin 121-A, 8-pp, describes non-clog pumps for handling solids in suspension. Included are vertical, horizontal and close-coupled types used to handle liquid components of industrial processes, industrial waste, and for such pumping applications as water supply, drainage and sewage handling. Specifications are included. Aurora Pump Div., The New York Air Brake Co.

111 Displacement Pump — Descriptive and engineering data covering the Eco All-Chem rotary displacement pump line for corrosive and hazardous fluids is contained in Bulletin AC56. Design and applications are described, and construction and performance data, operating specifications on stock models, dimensional data, and information on component materials, drives and mounts are included. Eco Engineering Co.

112 Centrifugal Pumps—Eight-pp Catalog A-156 describes and illustrates double-suction single-stage centrifugal pumps for general service where liquids of low viscosity are to be moved. In these pumps the case is split on horizontal center line and rotating parts can be removed for maintenance without disturbing piping. Cross section drawings and construction details for standard sizes up to 10-in. discharge included. C. H. Wheeler Mfg. Co.

113 Chemical Pump—Descriptive and engineering data on company's chemical pumps for all-purpose pumping of chemicals are presented in this informative brochure. Specifications are tabulated and a dimensional drawing is included. O.K. Machine & Tool, Inc.

114 Reciprocating Compressor—Bulletin F-80 is a 16-pp engineering catalog describing company's Type FMP compressor, a reciprocating unit built for pick-up service, gas boosting, general industrial use. Design and construction features are detailed and illustrated, and typical space plans are included. The ratings are up to 600 hp as belt-driven or packaged unit. The Cooper-Bessemer Corp.

PACKINGS AND SEALS

115 Teflon Packings—Eight-pp Form 6906 illustrates and describes split and folded types of envelope gaskets, solid gaskets and Teflon stuffing box, Vee-Flex, braided, plastic and various types of valve stem packings. Complete service recommendations for each type are included, as well as sizes available. Packing Div., Raybestos-Manhattan, Inc.

116 Mechanical Seals — Bulletin S-205-2, 8-pp, covers the complete line of chemically inert mechanical seals for handling all types acids, corrosives, solvents and gases. Provides construction, service and application information, including representative installations and engineering details. Crane Packing Co.

MECHANICAL POWER TRANSMISSION

117 V-S Drive Selection Tips — Bulletin 20P50, 44 pp, carries handy multi-color tables for quick and easy selection of variable speed Texrope drives. In addition to providing these tables for A, B, C and D section variable speed drives, booklet includes information on design features, drive principles, horsepower rating tables for A, B, C, D, and E section belts, a speed range table showing variation in rpm when using two Vari-Pitch sheaves in combination, and accessory equipment for Vari-Pitch drive. Allis-Chalmers Mfg. Co.

118 On V-Belts—Bulletin V-1400-B20-P, 8 pp, shows Worthington-Goodyear V-belts available for drives used in heavy industrial applications and miscellaneous light machinery drives. Featured are steel cable belts with highest hp ratings of standard section V-belts, for drives requiring extra strength and heavy continuous service. Also described are HY-T belts, a premium-rated synthetic fiber with surplus stretch removed; cord B-belts; open-end V-belts; light-duty V-belts and others. Bulletin contains listing of sizes. Worthington Corp.

119 Right-Angle Gearmotor—Booklet B-6597 presents company's Type R right-angle gearmotor for applications requiring 1 to 30 hp. By photos and diagrams, this bulletin describes construction and operation of the gearmotor, including double-enveloping gears utilized. A chart shows relationship between output torque capacity and total gear ratio. Westinghouse Electric Corp.

120 Roller Bearings—Catalog 55, 72 pp, contains specification data on all models of self-aligning roller bearings manufactured by the company. Describes self-aligning principle of concave rollers running between convex raceway, the Micro-Lock adjustment, and "Z" seal. Included is completely revised engineering data, new load rating tables, exploded view. Shafer Bearing Div., Chain Belt Co.

ELECTRICAL EQUIPMENT AND ACCESSORIES

122 D-C Motors, Generators—Bulletin GEA-6355, 12 pp, describes manufacturer's new Kinamatic d-c motors, 1 to 150 hp, built to NEMA standards. Information is given on electrical and mechanical features, versatility of the standard line, features for easier maintenance, plus dimensions and ratings. A companion publication, Bulletin GEA-6461, 6 pp, describes and illustrates Kinamatic generators, ¾ to 100 kw. General Electric Co.

123 Low-Voltage Distribution Equipment—Publication 1032-A is the 160-pp 1956-57 general catalog covering manufacturer's low-voltage electrical distribution equipment and components. It is offered as a source of information for specifying such equipment for applications up to 600 v. The catalog contains photos, descriptions, ratings, list prices and application information on: lighting and distribution panelboards, motor control centers, distribution center unit substations, safety switches, open knife switches, molded case circuit breakers and service entrance equipment. Available to qualified plant engineers, please state your job title when requesting this. General Electric Co.

124 Distribution Transformers—Catalog 3-500, 32 pp, provides design and product data on single- and three-phase distribution transformers, with high-voltage ratings from 480 to 15,000 v. Thirty-eight data tables are given for single-phase transformers with high-voltage ratings within 480 to 15,000 v range. Three phase transformer data is supplied in 22 tables. Kva ratings, physical dimensions, weights, losses, efficiencies at full and partial load, and per cent regulation for 1.0 and 0.8 power factor are among information listed. Gardner Transformer Div., Federal Pacific Electric Co.

On pages 227-228 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

125 Distribution System Tips — Bulletin GED-3039, 48 pp, gives information on distribution system planning. Features, advantages, application, operation and other data on system-engineered equipment for industrial power distribution, including switchgear, unit substations, switchboards, transformers, busways, wire and cable, conduit products, voltage regulators, capacitors, circuit breakers, safety switches, panelboards, control, motor controls, motors, turbines, rectifiers, and wiring devices are covered. Photos, diagrams and drawings, specifications, included. General Electric Co.

126 Automatic Transfer Switches—Publication 596, 16 pp, discusses factors to consider in the selection of automatic transfer switches. Additional information includes selection of type, how to specify the switch capacity, calculating line currents, and suggested specification for automatic transfer switches. Photos showing component parts and wiring diagrams are included. Automatic Switch Co.

127 Manual Motor Starters—Bulletin GEA-6358, 8 pp, gives new application information on company's CR-1061 and CR-1062 manual starters for fractional and integral horsepower

BULLETINS

(Begins on page 19)

motors to 7½ hp. Illustrated with photos and diagrams, bulletin includes enclosure and dimension data. General Electric Co.

128 Strongbox Solenoids — Bulletin GEA-6215A, 16 pp, gives new application and accessory information on company's industrial strongbox solenoids. Includes descriptive material on terminal covers and linkage pins, detailed outline dimensions on a-c strongbox solenoids, and new price figures. Photos, diagrams, and force and current curves are included. General Electric Co.

129 Relay Maintenance—Data Sheet 156UB features a general discussion of protective relay maintenance and testing with particular attention to equipment and records necessary for assuring safely operative relays and breakers. Describes types of test equipment commercially available, auxiliary instruments for trip-time calibration, standard means for conducting tests and routine to follow. Comparison table of various techniques in current application, and hook-up schematics included. Multi-Amp Corp.

130 Meter Socket Selection—Bulletin GEA-5878B, 20 pp, contains all basic information on company's meter socket line, including round and square die-cast sockets for single-phase and network meters, box-type for standard polyphase, and high capacity single and polyphase meters. Photos, dimensional drawings and connection diagrams included. General Electric Co.

131 Carbon Brushes—Catalog 56 is a 36-pp technical reference manual on carbon brushes for industrial and other applications. Includes description of grades, table of average characteristics, application information and recommendations, illustrations of brush styles and brush connections. Also covers methods of manufacture, company's engineering facilities and provides data on dimensions and tolerances. Pure Carbon Co., Inc.

132 Battery Chargers—Bulletin 11-210 illustrates features of automatic battery chargers. Shows a new type of battery line contactor, the contacts of which are renewable in the field; discusses reduced maintenance and other benefits offered. The Electric Products Co.

133 Cable Ladder—Specification and design data on company's ladder support system for holding cables and tubing are presented in 12-pp Bulletin 156-E. Dimensional diagrams are included. P-W Industries, Inc.

134 Cable Troughs—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special fastening devices to save time and labor. Contains full instructions for installations, load charts, accessory items, some typical installations and full list of distributors. The Globe Co.

135 Electrical Tapes—Bulletin P6-1 describing company's newly packaged line of electrical tapes lists each tape by its composition and function. Features four types—a polyethylene, vinyl, plastic coated and cloth tape—and gives advantages of each. Polyken Sales Div., The Kendall Co.

HEATING, VENTILATING AND AIR CONDITIONING

136 Heating, Ventilating Needs—Complete price and engineering information on company's air conditioning, ventilating, refrigeration and heating equipment is featured in this 38-pp 1956 Estimating Catalog. Covers fans, roof ventilators, air conditioning units, heating and cooling coils, condensing units, cooling towers, unit coolers, air heaters, condensers, control valves, forged flare fittings, pumps, motors, starters, switches, controls, filters, insulation, instruments, accessories. M. Blazer & Son.

137 Central Air Conditioners—These specification sheets, designated as Bulletins C-11000-S106P, S107P, and S108P, give complete dimensions and operating data on both vertical and horizontal models of company's line of central station cabinet type air conditioning units. Outstanding features such as flexibility and compactness described. Worthington Corp.

138 Diffusing Grilles—Catalog F-7757 features specification and performance data on continuous line air diffusing grilles for use in window sills and other applications requiring horizontal installation. Dimensional drawings and diagram of complete system are included. Barber-Colman Co.

139 Baseboard Heating—Sixteen-pp Bulletin 1231 contains photos, drawings and technical data on company's baseboard heating. Gives roughing-in-data, design and details of typical installations, capacities and procedures for selecting baseboard systems. C. A. Dunham Co.

DUST CONTROL

141 Electronic Air Cleaner—Catalog B-1425, 8-pp, describes and illustrates an electronic air cleaner for commercial and industrial applications. Complete with pictures, drawings and specifications, bulletin explains the cleaning of air by electrostatic precipitation and describes installation, operation, and maintenance of the units. Also covers movable nozzle washing and adhesive application, which permit these two cycles to be completely controlled and operated from outside the unit. Westinghouse Electric Co.

142 For Super-Clean Air—Bulletin 557-D describes company's Ultra-Filtration collector designed to provide super-clean air for the ventilation, cooling or air conditioning of electrical control rooms, laboratories, precision manufacturing areas, electric motors, and transformers; for process air to blowers, and diffuser plates; to recover hazardous radioactive materials and to pressurize work spaces in dusty areas. Dimensional diagrams and specifications are included. Wheelabrator Corp.

143 Electronic Air Cleaner—Twelve-pp catalog E-61 features complete engineering data, size and capacity tables and component parts description on company's electronic air cleaners. Dimension, capacity and selection table is included. Describes applications in various industries. Trion, Inc.

VALVES, PIPING AND ACCESSORIES

144 Closing Air Valve—Well documented and comprehensive, 12-pp Bulletin 200 describes Type CCAV controlled closing air valve —announced as a new concept for the protection of pipe lines against damaging effects of surge and built-up pressures or water hammer. Includes cutaway drawing showing design and operation features, installation drawings, dimension and capacity tables. Simplex Valve & Meter Co.

145 Solenoid Operated Valves — Bulletin W-7, on company's Cushioned solenoid operated valves, discusses their construction, operation, installation and servicing. Valve patterns available, and suggested applications for these valves are also treated. Dimensional data, parts list, electrical characteristics are included. Golden-Anderson Valve Specialty Co.

146 Slide Valve—Data Sheet Ub describes company's line of slide valves designed especially for use in pipeline transporting solid materials in liquids. Details of construction are covered in text and illustrated, together with operating mechanisms for manual or power operation. Line drawings with dimension tables give additional data. The Allen-Sherman-Hoff Co.

147 Bronze Globe Valve—Circular 605 details the advantages of company's bronze globe valve designed for higher-pressure applications. Includes cutaway view showing component parts and a table of dimensional data. The Lunkenheimer Co.

148 Control Valves—Six-pp Bulletin SK 356 features company's line of pilot operated control valves, describing operation, uses, optional features. Illustrated with photos and line drawings, bulletin includes tables which cover types of service, pressure ranges, condensed specifications. Valvair Corp.

149 Magnetic, Motorized Valves — Catalog V-55, 20-pp, illustrates and lists specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants. Covers gas valves, hydramotor and magnetic valves and includes photos, dimensions, application data, tables listing sizes, capacities, operating pressures and other data, as well as full specifications for each type of valve described. The Mercoid Corp.

150 Combination Pump Valves — Bulletin CPV 560, 18 pp, presents engineering data on a line of combination pump valves, silent check valves and specialty items. Pictures typical installations, includes cutaway views showing component parts, and tabulates working pressures, other specifications. Combination Pump Valve Co.

151 Steel Pipe, Tubing—This 6-pp folder, known as TDC-163A, furnishes information on analysis, mechanical and physical properties and creep and rupture data on many of the various tubing alloys which are proven satisfactory in elevated temperature service. Table also lists data on applications, short time strength, oxidation resistance, corrosion, resistance, and working qualities. Tubular Products Div., Babcock & Wilcox Co.

152 Unions and Fittings — Advantages of company's line of unions and union fittings are outlined in illustrated Bulletin D 255. A sectional view points out outstanding features and table lists specifications. The Fairbanks Co.

The two Reader Service Cards on pages 227-228 are easy to use, need no postage. Just circle the item number of bulletins wanted.

153 Improved Connectors — Bulletin 407 presents a line of split-flange connectors produced for the aircraft industry, but now available for general industrial use. According to bulletin this type of connector won't leak or loosen, is adaptable to any tubing joint, saves space, and is suited for hydraulics, steam and gases. Five styles are shown. Barco Mfg. Co.

154 For Low Pressure Pipes—Insulation for cold, hot water and low pressure steam lines is described in Publication INI.C7. Illustrated with photos, charts and a graph, this bulletin gives physical properties, thermal performance and limitations of this low pressure pipe insulation which is available with two types of jackets. Owens-Corning Fiberglas Corp.

MATERIALS HANDLING

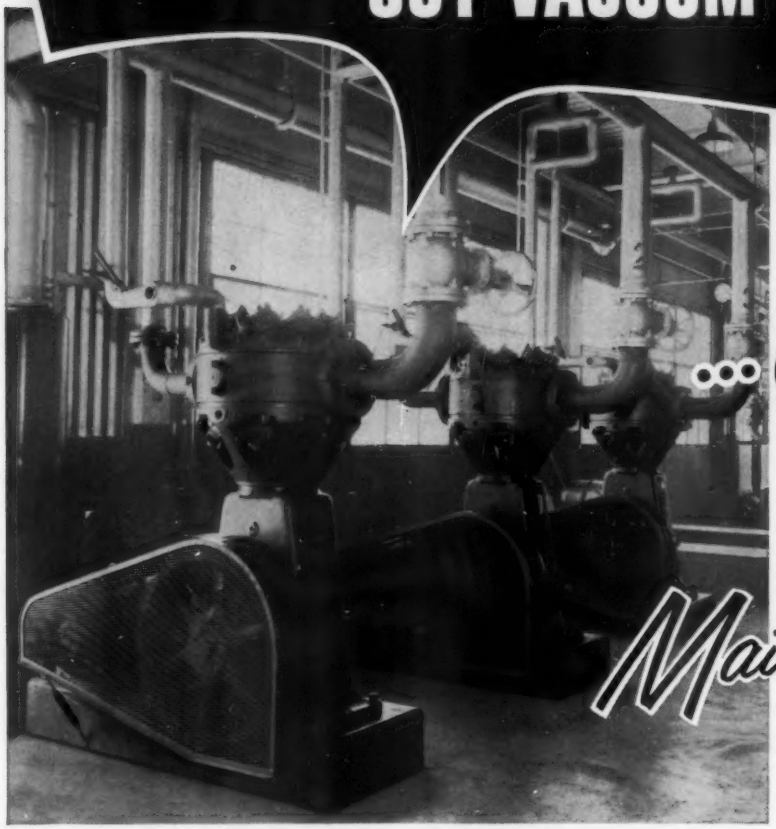
155 For Overhead Conveying—Catalog 220, 24 pp, describes many of the Coburn lines of overhead conveying equipment and hardware, including chain hoists, monorial carriers, continuous conveyors, and locks, switches and transfers. This equipment is designed to require a minimum of headroom, to simplify spotting of work directly over machinery. Illustrated with photos and drawings, catalog shows some typical installations, discusses typical track layouts, shows methods of supporting track and gives recommended spacing of brackets. Wickwire Spencer Steel Div., The Colorado Fuel and Iron Corp.

156 Overhead Cranes—Catalog M-100 is a 40-pp handbook covering electric overhead traveling cranes and other handling equipment. Profusely illustrated, contents include information on the latest developments in crane manufacture, classification of cranes, runways, electrical equipment and other data of interest to crane users. Dominion Bridge Co. Ltd.

157 Wire Rope Recommendations — Information-packed Bulletin DH-129D, 24 pp, covers more than 120 types of wire ropes used in construction by scrapers, shovels and winches etc.; in conveyors by button, disc, can and hook units; in cranes by truck or crawler, clamshell, overhead traveling, shop and other units; in steel mill and blast furnaces for car haulage, rope, coke oven pushers, levelers, scrap yard cranes; and many other applications. Each recommendation covers such points as rope diameters, construction, preforming, lay, grade and core. In addition, charts covering weights and breaking strengths are provided, as are photos and drawings of typical wire rope riggings and accessories. Hazard Wire Rope Div., American Chain & Cable Co., Inc.

(More Bulletins on page 229)

SIX YEARS CONTINUOUS OPERATION OF THESE JOY VACUUM PUMPS...



And not a penny for Maintenance!

(EXCEPT FOR OIL CHANGES)

Three Joy WGV-9 Vacuum Pumps, above, provide continuous vacuum power used to handle tin sheets in one of the world's largest can plants.

These Joy Vacuum Pumps, after six years, are still running without ever having a part replaced . . . not even a valve. In fact, the valves have not even required cleaning. The Plant Superintendent continues to be amazed at the high efficiency of these pumps and the absence of required maintenance.

Such service is no accident . . . Joy WGV-9's are built to give it. Vertical construction eliminates uneven cylinder wear and reduces installation cost. A lightweight truncated aluminum piston contributes to low power consumption. Replaceable cylinder liner, "Dual Cushion" valves, force-feed lubrication and non-adjustable, oversize main bearings keep maintenance cost low.

Joy engineering has built efficient and dependable operation into every type of Joy compressor —whether for low pressure, standard plant air, oil-free or high pressure applications. Helpful information about your compressor needs will be furnished by writing ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 103-15

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For more facts circle 514 on Reply Card

New BETTER way to insulate plant piping

gb SNAP*ON

Less than two years ago it was a time-consuming and expensive job to insulate plant piping. Not so today, thanks to a new concept in pipe insulation — G-B Snap*On, the new one-piece molded pipe insulation of fine glass fibers.

Snap*On goes on piping far quicker and easier than any other pipe covering, with less down-time or interruption of plant processes. It comes in 6' sections that can be snapped over piping in a matter of seconds. It's exceptionally light in weight, easy to apply even in tight spots. No time is wasted in clean-up, since Snap*On is clean and dustfree, won't crumble when dry or get muddy when wet.

All this adds up to quicker, easier application than you've ever experienced. So don't fail to try Snap*On the very next time you need insulation from chilled or heated piping where temperatures do not exceed 350°. You'll find there's absolutely *nothing* like it for *economical application, thermal efficiency* and *permanence.*

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Box 4832, San Juan, Puerto Rico

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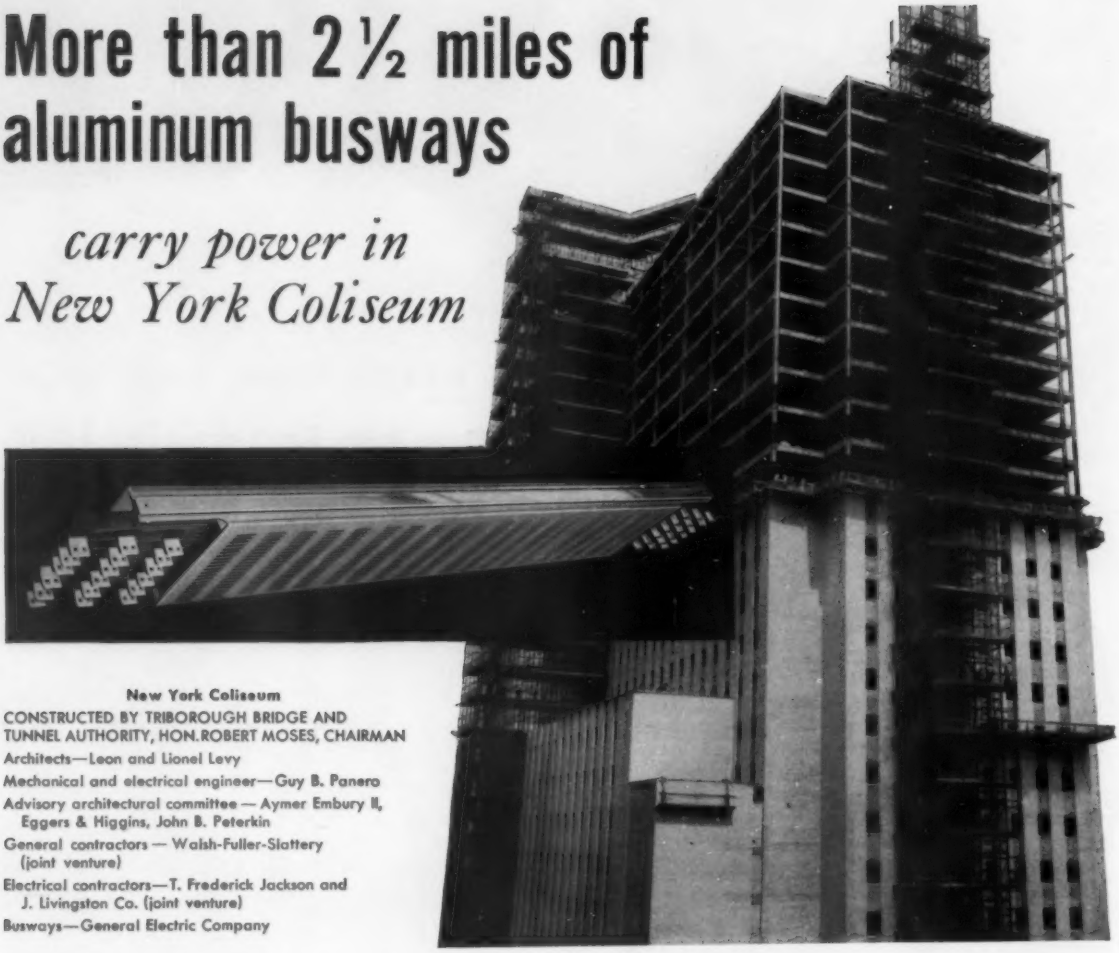
More than 2½ miles of aluminum busways

carry power in New York Coliseum



New York Coliseum
CONSTRUCTED BY TRIBOROUGH BRIDGE AND TUNNEL AUTHORITY, HON. ROBERT MOSES, CHAIRMAN
Architects—Leon and Lionel Levy
Mechanical and electrical engineer—Guy B. Panero
Advisory architectural committee—Aymer Embury II, Eggers & Higgins, John B. Peterkin
General contractors—Walsh-Fuller-Slattery (joint venture)
Electrical contractors—T. Frederick Jackson and J. Livingston Co. (joint venture)
Busways—General Electric Company

Important Innovations in Coliseum

New York City's new Coliseum is modern in every detail, particularly in its electrical distribution system. This 26-story office building, combined with 365,000 square feet of display space, has one of the first major installations of a higher voltage distribution system (480Y/277 volts). More than 2½ miles of busway incorporating aluminum conductors were used to feed power to this huge structure.

Higher Voltage System Saves Money

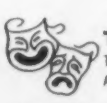
The higher voltage system provides greater capacity and flexibility than conventional systems. Yet it requires only half as many, or half as large, risers and feeders. Characteristics such as excessive voltage drop or costly power losses present no problems to this system. The use of lightweight aluminum bus bars makes the equipment easier to handle and easier to install.

More and more manufacturers of packaged electrical distribution systems are finding that Alcoa® Aluminum Bus Conductor offers advantages of lower cost, availability, design flexibility. Aluminum distribution bus weighs a third less than a copper system of equal conductivity. Pound for pound, it has greater current-carrying capacity than cable in conduit.

Alcoa Aluminum Is Your Best Bet, Too

Wherever your production requirements demand an efficient, flexible electrical distribution system, it will pay you to specify busways with Alcoa Aluminum Conductors. Write us for the names of manufacturers who specialize in this lighter, better, more economical product. Aluminum Company of America, 2301-F Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

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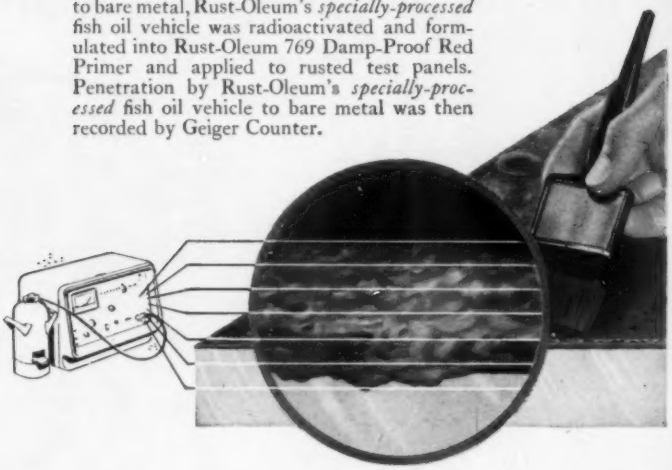
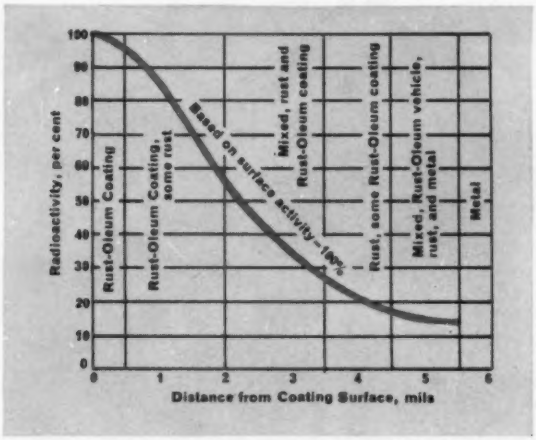
To trace Rust-Oleum penetration through rust to bare metal, Rust-Oleum's *specially-processed* fish oil vehicle was radioactivated and formulated into Rust-Oleum 769 Damp-Proof Red Primer and applied to rusted test panels. Penetration by Rust-Oleum's *specially-processed* fish oil vehicle to bare metal was then recorded by Geiger Counter.





It's easy to actually see Rust-Oleum penetration through rust to bare metal by following the curved line on the graph above. The curved line illustrates Rust-Oleum *penetration* at each mil level down to bare metal as recorded by Geiger Counter and Gas Flow Proportional Counter.

Proved by industry for over 30 years on tanks, girders, roofs, boilers, stacks, wire fences, metal sash, machinery, metal buildings, etc. Excellent, too, for gutters, tools, trucks, under autos, screens, metal furniture, pipes, playground equipment around the home. Rust-Oleum is the modern way to Stop Rust and beautify as you protect. Write for color charts and literature.

See our Catalog in Sweets, or write for complete information. Prompt delivery from Industrial Distributor stocks.

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penetration means to you!

The results of nearly three years radioactive research prove that Rust-Oleum's *specially-processed* fish oil vehicle penetrates through rust to bare metal.

This penetration enables you to stop rust, because the Rust-Oleum fish oil vehicle soaks through the rust to bare metal and into the tiny pits where it drives out air and moisture that cause rust. Because of this penetration, you can apply Rust-Oleum 769 Damp-Proof Red Primer directly over sound rusted surfaces—usually eliminating costly surface preparations. Rust-Oleum resists salt water, sun, fumes, heat, humidity, and weathering. Attach coupon to your letterhead for your thirty-page report entitled, "The Development of a Method To Determine The Degree of Penetration of a Rust-Oleum Fish-Oil-Based Coating Into Rust On Steel Specimens," as prepared by Battelle Memorial Institute technologists.

STOP RUST!

with

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There is only one *Rust-Oleum. It is distinctive as your own fingerprint.*

Rust-Oleum is *exclusive*, using a specially processed fish oil vehicle that penetrates rust to bare metal. Accept no substitute. Buy or specify Rust-Oleum. You'll be happy that you did.

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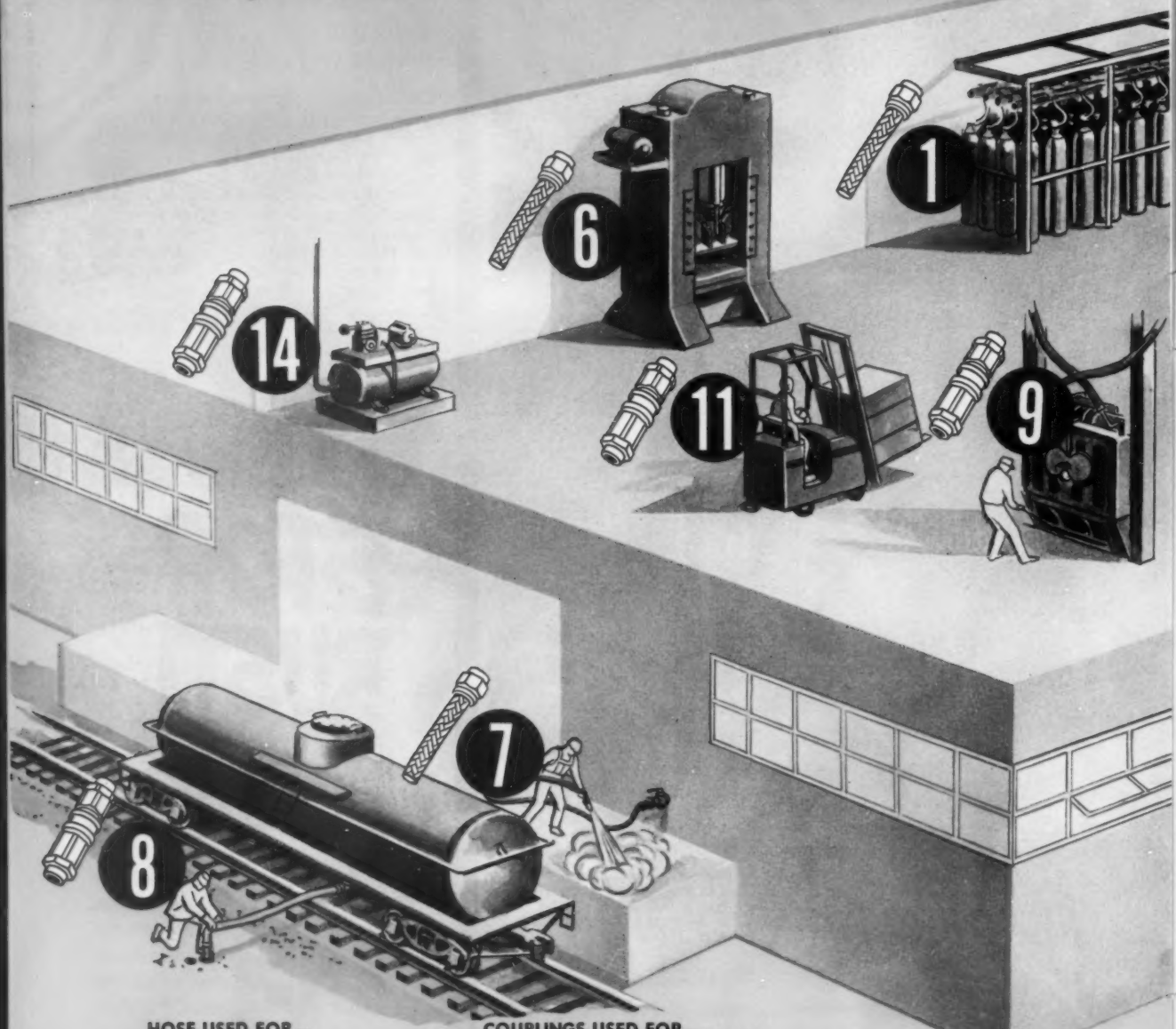
Leakproof couplings and durable metal hose... versatile problem-solvers for any industrial plant



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13. Machine Cleaning
14. Air Lines for Tools

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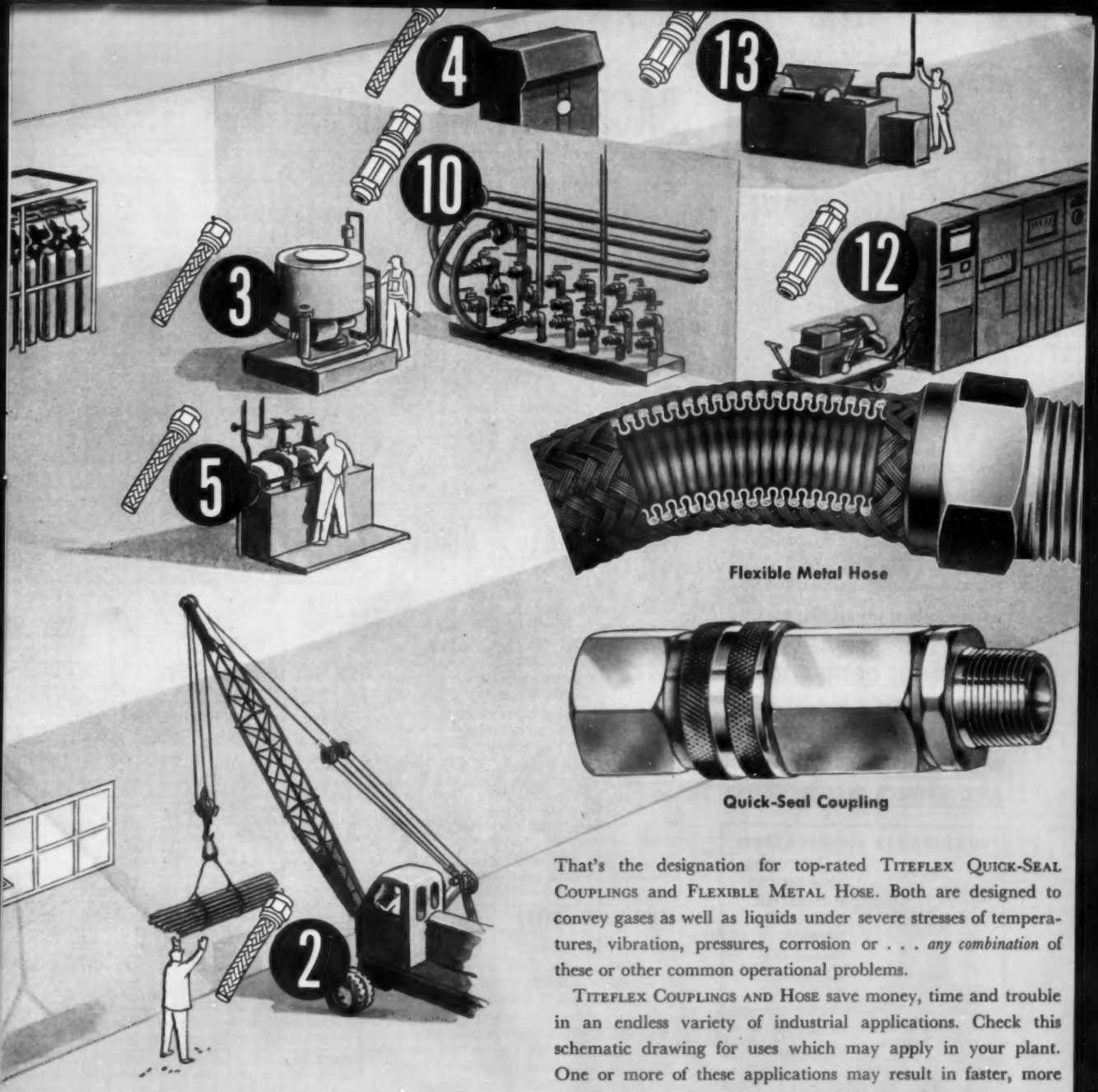
TITEFLEX Couplings Metal Hose for any corrosion, temperature, vibration, or pressure problem



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in all industrial plants

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says—PITTSBURGH TUBE COMPANY

"Our 70,000 pound Draw Bench was designed to operate at a maximum of 80 feet per minute, full load. We decided to increase the drawing speed on lighter tubing to 100 and 104 feet per minute. This overloaded the Speed Reducer, however, causing it to overheat. We tried four different makes of oils without success before trying LUBRIPLATE A.P.G. 90. With LUBRIPLATE, we are able to pull heavier tubing than before at 104 feet per minute without the Reducer overheating."

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Maintenance Engineer

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE

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For more facts circle 520 on Reply Card

BACKTALK about our past issues

Edited by Marjorie E. Weissman

Plant Engineer—Who and What

PLANT ENGINEERING:

"I passed along the reprint of 'The Plant Engineer' from Simon and Schuster's 'Guide to Earning a Living' to our Plant Manager. He was very interested in it and asked that I provide him with a copy of it for his use. Do you have an additional copy of the reprint that I could give to him?" *Henry F. Smith, Plant Engineer, Sumner Chemical Company, Inc., Zeeland, Mich.*

► Glad to oblige with two extra copies of this reprint which outlines the requirements for and duties of, a plant engineer.—*Editors.*

Photostats of Grouting Articles

PLANT ENGINEERING:

"During 1950 there appeared in the September and December issues of PLANT ENGINEERING, articles on grouting practices, written by Mr. Leon A. Watts of the Allis-Chalmers Manufacturing Co.

"Shortly after the appearance of these articles we obtained several copies of them to give to our junior supervisors, who found them very useful. We are wondering if it would now be possible to obtain a new supply." *R. P. Burke, Maintenance Supervisor, Monsanto Chemical Co., St. Louis, Mo.*

► We are sorry that our supply of tear sheets of these two articles is entirely depleted, but photostat copies are available at 60 cents a page.—*Editors.*

Transformer Survey

PLANT ENGINEERING:

"Would you be good enough to send us a copy of a recent report on dry type transformers which your publication put out after conducting a survey on the subject. We would certainly appreciate your compliance with this request." *Mary L. Solomon, Advertising Department, Pennsylvania Transformer Co., Canonsburg, Pennsylvania.*

► We are pleased to send you a reprint of the summary of this survey. The results of the survey appeared in the article "Dry Type Transformer Safe, Reliable, Flexible, Survey Says," in our October, 1953 issue.—*Editors.*

Thermocouple Care

PLANT ENGINEERING:

"In the March, 1956 issue of PLANT ENGINEERING there appeared an article entitled 'Thermocouples—These Industrial Watchdogs Need Testing and Protecting.' This laboratory is constantly involved with the problem of checking the accuracy of thermocouples used both for recording and controlling temperatures. The article in your magazine is an excellent and concise illustration for the selection, testing and care of thermocouples. It would be appreciated if two copies of it could be sent to this laboratory." *Maurice H. Simpson, Chief, Operations, Environmental Branch, LN, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, Pa.*

PLANT ENGINEERING:

"Please send me four copies of your article entitled 'Thermocouples—These Industrial Watchdogs Need Testing and Protecting' by R. I. Betzenhowser, published in your March 1956 issue.

"In these days of 'controls' it is necessary that we all become as informed as possible on these control devices. The copies of the article that I am requesting will go to our research Department, Plant Maintenance Department and to the Engineering Department of each of our two plants." *Robert R. Stenger, Asst. Plant Engineer, Josten's, Owatonna, Minn.*

New Way to Write Specs

PLANT ENGINEERING:

"We are interested in procuring a fork lifter as per the enclosed cartoon which

appeared in the March issue of PLANT ENGINEERING. We would appreciate it if you could furnish us any possible sources of such equipment." *Lawrence Nager, Jaco Pants, Inc., Winder, Ga.*

► Mr. Nager's inquiry has been referred to Mr. Elmer F. Twyman of The Yale and Towne Manufacturing Co., who will be able to give him information regarding fork trucks.—*Editors.*

Navy's Tungsten Knife

PLANT ENGINEERING:

"In your March, 1956 issue, on page 52, there is a very interesting article on a tungsten knife for cutting aluminum. If there is any additional information available, I would appreciate receiving it." *Henry T. Gramann, Chief Engineer, The Corbett Corp., Houston, Texas.*

► This knife was developed at the Boston Naval Shipyard and described, originally

In water conditioning...

the tough jobs

go to

W. H. & L. D. BETZ, Philadelphia, Pa.

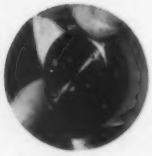
Ask these questions, too, when you judge a fluorescent lamp...

Is it made with Halo Phosphor?

No other phosphors in use today can match Halo Phosphors for maintaining high light output and original color. Westinghouse (and only Westinghouse) uses Halo Phosphors throughout its entire fluorescent lamp line.

Are its electrodes built for longest lamp-life?

Constant development of new and better ways to make fluorescent lamp electrodes has enabled Westinghouse to *triple* the life of its fluorescent lamps since 1948.



Is it easy to seat securely?

Westinghouse fluorescent lamps are built with "guide bumps" on the end-caps. Easily felt with the fingers during lamp installation, they tell at a touch when the lamp has been securely seated in its sockets.

For the full story on how to get more for your money in fluorescent light, contact your Westinghouse Lamp representative. You can be sure . . . if it's Westinghouse.

WATCH WESTINGHOUSE

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU***

For more facts circle 522 on Reply Card

BACKTALK

in the 'Bureau of Ships Journal,' December, 1955. The editor of the Journal, at the Bureau of Ships, Department of the Navy, Main Navy Building, Washington, D.C., will, we are sure, be able to supply any further information.—*Editors.*

Maintenance by the Clock

PLANT ENGINEERING:

"The article 'Maintenance Control—By the Clock,' appearing in the March, 1956, issue, by Messrs. Armstead and Beerle is of much interest to the writer.

"Would it be possible to obtain four copies of this article for plant distribution here?"—*Philip A. Repino, Plant Engineer, Lebanon Steel Foundry, Lebanon, Pennsylvania.*

▶ We are sending you four sets of tear sheets of this article and are pleased to know that it has proved so interesting to you.—*Editors.*

Government Manuals

PLANT ENGINEERING:

"Please send the complete list of all Technical Manuals which are issued by the Government Printing Office in Washington, D.C.

"These manuals concern all phases of maintenance problems and are listed in the article 'How the Army Controls Maintenance' in the April, 1956 issue of PLANT ENGINEERING." *Clayton C. Verlo, Asst. Manager of Engineering, The Richardson Company, Melrose Park, Ill.*

▶ This list contains the titles of more than 50 manuals available from the Superintendent of Documents, U. S. Govt. Printing Office, Washington, D. C.—*Editors.*

Paint Roller Covers

PLANT ENGINEERING:

"Please send to the writer's attention additional information on the paint rollers mentioned in the article 'What Paint Roller Cover Where' which appeared in the February, 1956 issue of your magazine." *L. V. Lanese, The Lubrizol Corp., Cleveland, Ohio.*

▶ We have written to the E Z Paintr Corp., 4051 S. Iowa Ave., Milwaukee 7, Wis., asking them to forward to you information on paint rollers.—*Editors.*

Cleaning a Forge Shop

PLANT ENGINEERING:

"Having noted the help you have offered others in past issues of PLANT ENGINEERING, we feel that you can probably recommend several contractors who participate in cleaning the interiors of structural steel buildings. The accumulation of dust, dirt and scale, containing some oil, is becoming a fire hazard in our forge shop and we would appreciate some suggestions." *George I. Taylor, Engineering Department, Tube Turns, Inc., Louisville, Ky.*

▶ Mr. Taylor's confidence in our ability to help him find a contractor for the job of cleaning the forge shop in his plant is indeed flattering but, we hope, not misplaced. We are sending him the names of several contractors who would be interested in doing this type of work.

It might be worth while to contact the local Plant Engineers Society, since it is probable that various members have had similar work done in their own plants, and could offer some helpful suggestions or information. The Directory of the American Institute of Plant Engineers contains the location of all Plant Engineer's clubs in this country, and a listing of the members.—*Editors.*

Cry for Help Answered

PLANT ENGINEERING:

"Thank you kindly for answering our cry for help on circular levels. Thanks to you, we were able to purchase the type of level necessary for the job and are already using them.

"Occasionally, a situation arises such as we had here—one wants to purchase an item, but can't find any firm that manufactures it.

"Your services were appreciated and should our needs require it, we shall contact you once more." *Paul R. Unger, Jr., Plant Engineer, H. Warshow & Sons, Inc., Montoursville, Pa.*

▶ The name of Geier & Bluhm Inc., 671 River St., Troy, New York, was suggested as a source for buying circular levels. We are glad it proved helpful to one of our readers.—*Editors.*

Protection Against Crabs

PLANT ENGINEERING:

"Perhaps you could help us. We are looking for thumb guards to be used by workers in removing the mouths of crabs from the shell. If you have in your files the address of a company that makes something for this purpose it would be appreciated if you would let us know." *William M. Rhett, Plant Manager, Blue Channel Corp., Beaufort, S.C.*

▶ We have sent Mr. Rhett the names and addresses of several companies who, we believe, will be able to supply the answer to the problem.—*Editors.*

Plant Engineers' Activities

PLANT ENGINEERING:

"Please send two reprints of the report on GM Plant Engineers Committee activities which appeared on pages 108 and 109 of your February, 1956 issue." *W. N. Witheridge, Assistant Director, Production Engineering Section, General Motors Corp., Detroit, Mich.*

▶ No reprints have been made of this article, so we are sending you two tear sheets which we hope will serve your purpose just as well.—*Editors.*

how to judge a fluorescent lamp . . . point no. 4

ask about **FULL SELECTION**

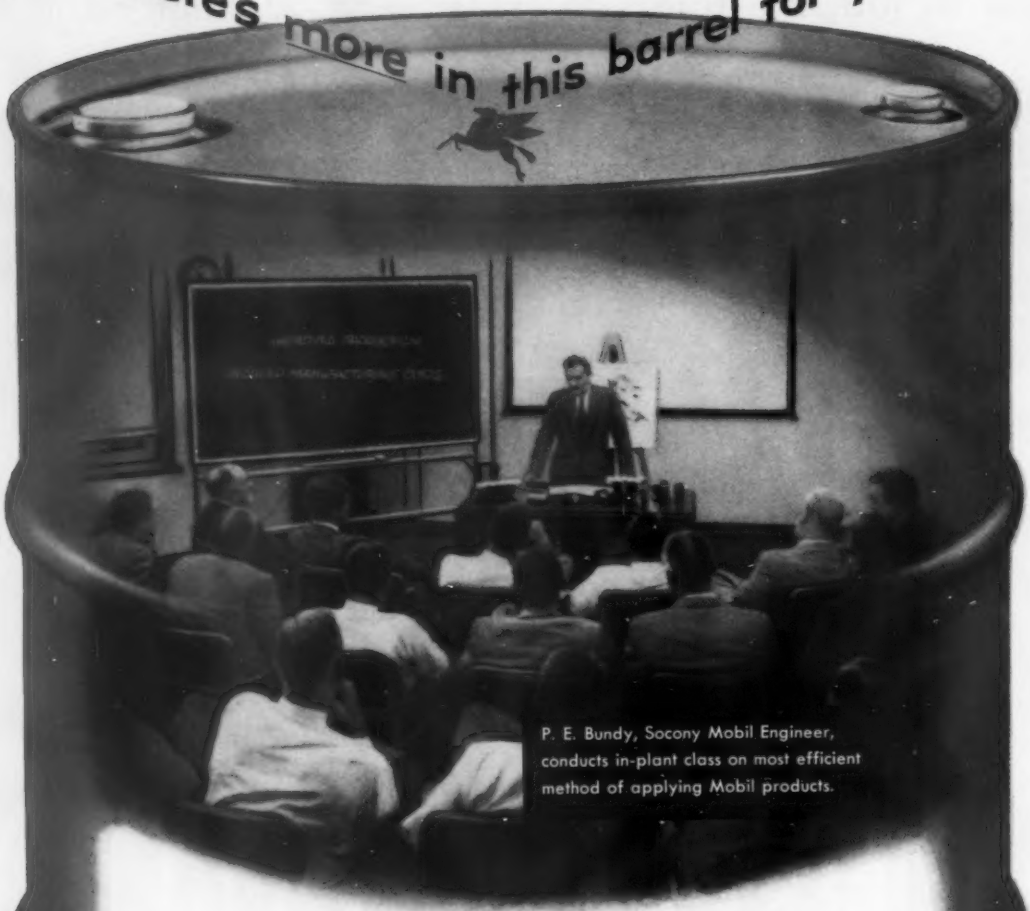
Smartest move you can make when you buy fluorescent lamps is to see to it that you get precisely the right type, size and color for the lighting job to be done. In the Westinghouse fluorescent family of 290 different lamps—including Slimline and Rapid Start—there's a type and size precisely right for every office, plant and merchandising application. And the full Westinghouse color range includes seven different shades of "white" alone. You can be sure . . . if it's Westinghouse.

WATCH WESTINGHOUSE

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU***

For more facts circle 523 on Reply Card

There's more in this barrel for you...



P. E. Bundy, Socony Mobil Engineer, conducts in-plant class on most efficient method of applying Mobil products.

MORE IN-PLANT TRAINING

to help you improve production and cut costs!

With Socony Mobil petroleum products we offer you more in-plant training courses and seminars than any other oil company. Lubrication experts instruct your personnel in the most efficient, most economical methods of applying and using our products. This thorough training eliminates over-use and waste—helps improve your production and lower your unit costs.

Socony Mobil products are also backed by *more* field engineers serving industry . . . *more* continuous research to assure continually improved products . . . *more* services for analyzing petroleum products in use . . . *more* approvals from machine builders . . . *more* practical experience—90 years!

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS

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For more facts circle 525 on Reply Card ⟶

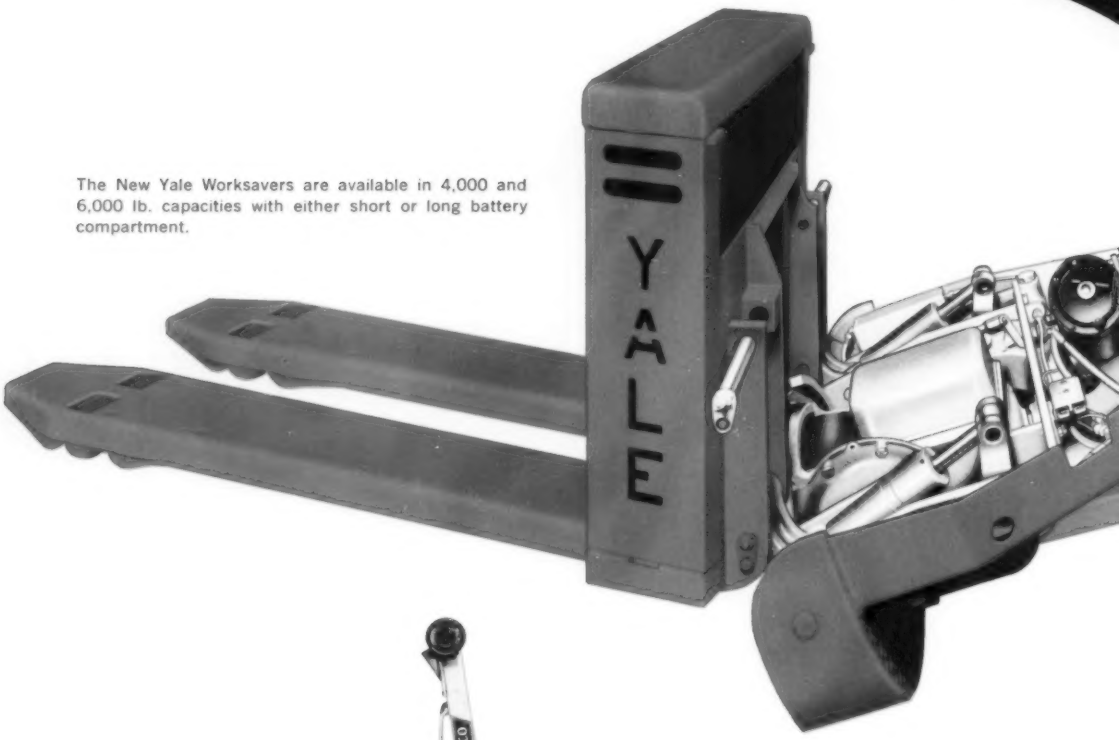
exclusive

new
YALE
PALLET TRUCK
design

more power . . . easier to maintain . . . more maneuverable

The **NEW YALE** *WORKSAVER*

The New Yale Worksavers are available in 4,000 and 6,000 lb. capacities with either short or long battery compartment.



• HIGH CAPACITY BATTERY FOR EXTRA POWER

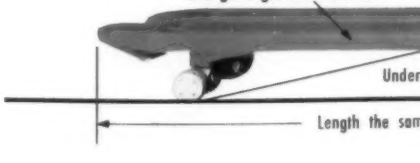
New Yale Worksavers are available with either short or long battery compartments. Both models accommodate extra-capacity batteries for greater output and quick response to power demand. The short compartment takes a 6-cell, 13-plate battery to provide adequate power for an 8-hour operation. The long compartment houses a 6-cell, 25-plate battery for handling operations with extra power requirements equally suitable for nickel alkaline batteries. Maximum battery protection is assured by a completely enclosed battery compartment while hinged covers make battery service easy.

• GREATER UNDERCLEARANCE EASES RAMP

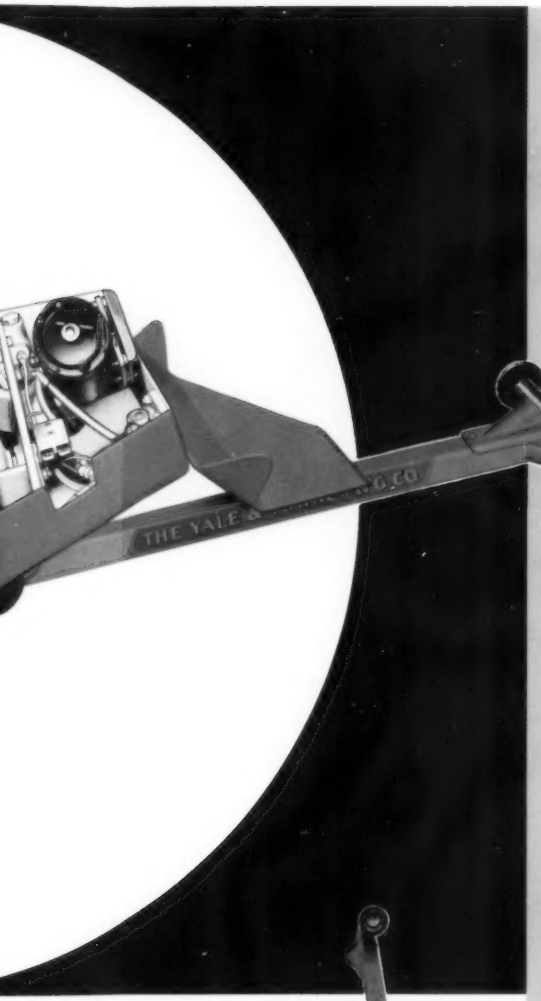
Elevating linkage uses compression tubes to actuate pallet wheel high in the forks these tubes make possible a pallet fork unde greater than 5". Front-end underclearance always remains 3" w truck is in raised or lowered position. This extra grade clearance m work much easier for the operator.

Compression tubes for lifting high up in forks for

and good ground clearance



...ER... point by point the best pallet truck



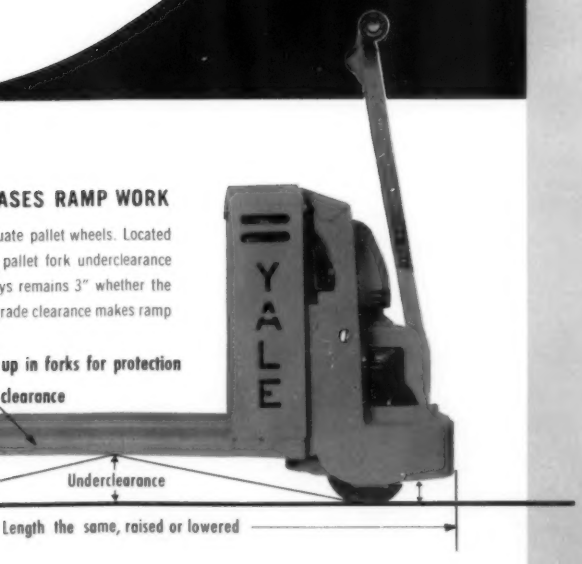
• **HIGH MANEUVERABILITY** — Equipped with short battery compartment, the new Worksaver is only 24" longer than the load . . . only 33" longer than the load with a long battery compartment. Both size battery compartments are shorter than ever . . . give the new Worksaver the compactness that cuts down "lost space".

• **MAXIMUM LOAD STABILITY**—Twin vertical lifting cylinders provide load rigidity even under toughest load conditions. Stability in travel and turning with the new Worksaver is achieved by maintaining a low center of gravity.

"BREAKAWAY" Feature Simplifies Maintenance

Hoist motor swings out for quick cleaning and brush renewal . . . contactors with time delay unit can be checked through battery compartment . . . drive tire can be replaced in only 20 minutes without disturbing the drive unit . . . all lubrication fittings can be serviced without removing any covers or turning truck over. Just remove two pins and the entire front compartment swings back (see above illustration). Without removing covers every mechanical and hydraulic unit thus becomes accessible for quick and easy maintenance.

The removal of two pins permits one man to swing back the entire front compartment.



ASES RAMP WORK

uate pallet wheels. Located
pallet fork underclearance
ys remains 3" whether the
rade clearance makes ramp

up in forks for protection
clearance

• **SMOOTH TRAVELLING**—Two speeds forward and reverse—with automatic time delay between speeds—give smooth acceleration. Dual-acting braking system for controlled braking action. Smooth starts and stops prevent toppling of loads . . . reduce breakage . . . provide maximum safety for the operator.

• **EFFORTLESS STEERING** — Drive unit is mounted on widely separated tapered roller bearings and large-diameter ball bearing turntable. Wide-spread, dual-type trailing wheels assure better load distribution . . . make turning easy.

• **EASY REACH OF ALL CONTROLS**—Speed control by dual cams. Simple pushbutton control for lifting is located on the handle. Controlled lowering by footpedal. Balanced steering handle shuts off power and applies brake when in full up or full down position.

Choose the Yale Worksaver "best for you"

If your materials handling operation calls for a truck tnat is light in weight, small in size and has plenty of power, the answer is a Yale Worksaver. For here is a truck specifically designed to speed handling in areas where space is at a premium. And, Yale's complete line of Worksavers lets you choose the model exactly suited to your handling needs. Whether you choose a pallet, platform, tractor or high lift fork model, you know that from the very first day your Worksaver goes into operation, savings in space, time and manpower begin. To find out more about Yale Worksavers write The Yale & Towne Manufacturing Co., Philadelphia 15, Pa.

YALE | **Industrial Lift Trucks and Hoists**

Hall Industrial Water Report

VOLUME 4 JUNE 1956 NUMBER 3

Slime—a Low Life That Rates High as the Cause of Corrosion, Deposit Formation, and Offensive Odors

Control of slime in cooling and process water depends on proper diagnosis of the problem and use of effective disinfectants.

A Difficult Odor Problem

Every Monday morning when the air conditioning system was started following Sunday shutdown, one of Pittsburgh's largest department stores was embarrassed by a strong musty odor. This usually disappeared before the store opened at noon, but when the dehumidifiers were shut down several days for repair, the odor was so distressing and persistent that Hall Laboratories was called on for help.

Hall engineer, R. A. Danesi, recognized that aerobic microorganisms washed from the air filters into the spray unit pans were responsible for the odor. When units were shut down, there was insufficient aeration to keep the microorganisms alive and they died and rotted.

Danesi immediately fed an odorless disinfectant to the pans. The obnoxious odor did not disappear fast enough, however, and it was necessary to use a strong oxidizing agent as a temporary measure.

A sample of the slime was brought to the laboratory for identification. The report confirmed the presence of protozoa and bacteria which continue to live and multiply so long as they receive an adequate supply of air. Since equipment shutdowns could not be avoided, control would have to be accomplished by effective disinfection to prevent accumulation of slime.

Feeding of Calgon Algaecide® and regular water washing of the units eliminated the odor for a time. When the odor returned, another disinfectant was fed. This also worked for a time. But these were tough little bugs which built up immunity to either material when it was used continuously.

Alternate feeding of the two chemicals every two weeks proved to be too much for them, however. This procedure solved the problem and the store now has odorless operation of the treated units.

Labor Costs Effectively Reduced

Fouling of the evaporative condensers used to cool ammonia for process refrigeration was so severe in a rubber manufacturing plant serviced by Hall's Boston office that the units had to be hand-cleaned every week end to insure continuity of operation through the following week.

Investigation revealed that slime was retarding heat transfer. This condition was aggravated because the slime also trapped air-borne talc to such an extent that deposits completely filled the spaces between some of the condenser tubes. Head pressure on the ammonia compressors was continuously at its upper limit and was high enough at times to shut them off.

Treatment was started with 50 ppm of calcium hypochlorite to kill the growth and the sytem was flushed to get rid of the dead slime-forming organisms. Thereafter, calcium hypochlorite was added in sufficient amount every shift to give 1 ppm residual chlorine one hour after treatment. 5 to 10 ppm of Calgon T® was also added continuously to the water for control of corrosion.

Head pressure on the ammonia compressors shortly decreased to 50 psi below the former high, reflecting improved heat transfer in the evaporative condensers. Manual week end cleaning of the condensers is no longer required. Regular operators are able to take care of feeding chemicals so that there has been no increase in labor cost.

Formaldehyde to the Rescue

A Michigan laboratory engaged in the manufacture of pharmaceuticals, culture media, and related items had a very complicated problem of slime growth. The circulating water from the cooling tower was used in the vacuum pan system where much of the proteinaceous material was concentrated as part of the manufacturing process. The tower water acted as a barometric condenser so that material boiled out of the vacuum pans was caught in the water and traveled through the cooling tower water circuit. Slime development was so great that the slats and interdecking were completely filled and water cascaded in sheets down through the central part of the tower.

Chlorophenate concentrations of 50 to 100 ppm had been found to be ineffective in controlling the slime-forming organisms. Hall engineer, E. S. Stewart, tried calcium hypochlorite. He experienced fantastic chlorine demand and the development of large amounts of foam. The foaming was controlled easily with Hagan C-1 Antifoam®, but the tremendous chlorine demand rendered the procedure impractical.

Stewart tried formaldehyde as a disinfectant. At a concentration of 40 ppm, this chemical has inhibited slime development sufficiently that plugging of the tower is prevented. Further improvement in conditioning can now be accomplished by proceeding on an orderly rather than an emergency basis.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

Water is your industry's most important raw material. Use it wisely.

Hall Laboratories, Inc.—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Handling Metal Wall Sections

FACED with the problem of handling fabricated metal parts measuring up to 12 ft in length to and from production areas and temporary storage, the E. F. Hauserman Company, Cleveland, Ohio, found the solution in the use of a 10,000 lb capacity high lift platform truck. The parts are used in the manufacture of movable walls used for non-residential construction. Because of the length of the parts, fork trucks could not be used, since it would have been impossible to transport crosswise loads along narrow aisles and through production areas.

The platform truck is capable of handling the loads lengthwise and elevating them to the necessary height for storage.

Metal skids, used to combine the metal sections into unit loads of approximately 10,000 lb were equipped with retaining members to stabilize the load. Since the unit load size was determined for maximum ease of removal by press operators, bending and reaching for individual metal parts during fabrication, is kept at a minimum. *From a release of The Elwell-Parker Electric Company, Cleveland 3, Ohio.*

Grinding Mirror-Finish Carbides

USUAL PROCEDURE for obtaining ultra high polish finishes on cemented carbide tools such as rolls, mandrels and dies, is to finish grind with diamond wheels, then hand or machine lap with diamond paste.

In attempting to reach finishes of three microinches or less, hand lapping is time consuming, and geometrical and dimensional accuracy may be lost if an appreciable amount of material must be removed in order to get beneath surface scratches made by the grinding wheel.

Photo: Wallingford Steel Company

Cemented carbide rolls for rolling stainless steel are ground to mirror finish

In a New England steel mill, mirror finishes are obtained on cemented carbide rolls used in a mill for rolling stainless sheet, by grinding only.

After preliminary grinding with a diamond wheel, the rolls are reconditioned in two steps. First, minute imperfections are removed with a 600 grit diamond semi-finishing wheel, then a 1500 grit finishing wheel is used. With this wheel it is possible

(Continued on page 40)

Automatic In-Line TV Tube Aluminizing System Uses Dollies Operating on Circular Track

A DUAL-TUBE, in-line aluminizing system for television tubes, has been installed by Thomas Electronics, Inc., Passaic, N. J.

The aluminizing process is carried out after a coat of clear lacquer has been sprayed over the layer of yellow phosphors on the inner surface of the tube-face. A coil of aluminum wire is placed within the loops of a tungsten filament in a removable holder which extends up into the neck of the tube. The uncoated tube is placed, neck down, over the loaded filament. The tube is then evacuated and the aluminum vaporized by electrically heating the filament. The aluminum condenses on the interior surface of the tube, forming a thin metallic "mirror" behind the phosphor screen. This produces a brighter picture than would otherwise be possible.

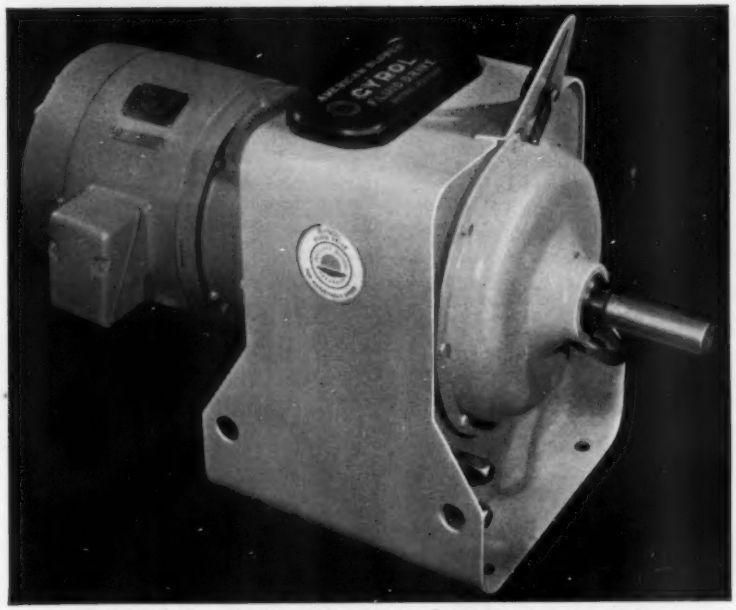
Aluminizing carts, each with two tubes, travel on circular track, complete cycle in 6½ min. Hood exhausts fumes from mechanical vacuum pumps on carts

The aluminizing equipment comprises 10 dollies operating on a circular track 17 ft in diameter. One operator is required to load the uncoated tubes and unload the finished tubes after they have completed the circuit of the track. All operations are automatic, actuated by trip switches and electrical contacts on the fixed track.

Each of the dollies can carry an aluminizing cart that on which two tubes can be evacuated and coated simultaneously. The self-contained pumping system on each cart uses a 10 cfm mechanical pump and a 4-in. high speed booster pump. Overall cycle time is 6½ min.

Aluminizing equipment originally used was stationary and required three men to operate it. Working at full capacity, it could aluminizes 80 tubes per hour per unit, compared with a potential of 192 tubes per hour on the new 10-cart system. *From a release of F. J. Stokes Machine Company, Inc., Philadelphia, Pa.*

Why you should include Gýrol Fluid Drives in your plans for automation



Compact, flange-mounted Type VS, Class 2 Gýrol Fluid Drive — 1 to 25 hp.

For one thing, Gýrol Fluid Drives provide adjustable, *stepless* speed control of driven machinery, using *standard*, constant-speed motors – without complicated electric circuits or starting devices.

Adaptable to remote, manual, or automatic speed control, Gýrol Fluid Drives are compact, self-contained units – requiring only the conventional flexible-coupling connections to the motor and load. They provide complete shock absorption, are easy to install in a variety of arrangements of driving to driven machinery. Why not call our nearest branch for full details today?

Typical Applications

PUMPS, AGITATORS, MIXERS

CONVEYORS, CABLE & ROPE MACHINERY

FANS AND BLOWERS

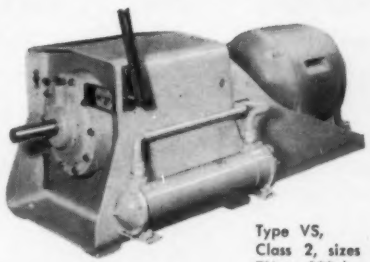
CENTRIFUGAL COMPRESSORS

PAPER AND PRINTING MACHINERY

TEXTILE MACHINERY

Complete range of sizes — 1 hp to 12,000 hp

The Gýrol Fluid Drive line includes a complete range of sizes, from 1 to 12,000 hp. All save power through lower horsepower requirements. A minimum number of wear points cuts maintenance. And, because Gýrol Fluid Drives bring about reduced speeds and pressures, driven equipment lasts longer.



Type VS, Class 2, sizes 7½ to 800 hp.

American Blower products serve industry

- Air Conditioning, Heating, Ventilating Equipment
- Mechanical Draft Equipment
- Industrial Fans and Blowers
- Centrifugal Compressors
- Gýrol Fluid Drives
- Dust Collectors
- Refrigerating Machines

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American-Standard

AMERICAN 75th ANNIVERSARY YEAR 1881 - 1956 **BLOWER**

For more facts circle 527 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

to obtain a finish measuring less than one microinch rms.

In using this method of obtaining ultra high finishes, a wheel speed of about 3500 rpm and a slow work speed are used. The correct minimum grinding pressure is regulated and maintained by means of an ammeter connected to the wheel drive motor and which the operator can watch constantly. *From Grits and Grinds, published by the Norton Company, Worcester, Mass.*

Anodized Aluminum Wire Retains Ductility, Insulation

ALUMINUM wire, which has been given electrical insulation properties by anodizing it with alternating current, but which remains sufficiently ductile to withstand the stressing and flexing operations in winding electrical coils, has been developed by the Aluminum Company of Canada. Lack of ductility in aluminum wire anodized by former methods had precluded its use in electric motors.

The new process involves pulling the wire through tanks containing chemical solutions which give it a hard thin coating of aluminum oxide. This coating retains its insulating properties at high temperatures. Insulation generally used on magnet wires for winding electrical motors, rapidly loses its insulating properties as temperatures rise above 80 C or 100 C. *From a release of Aluminum Ltd. Sales, Inc., New York, N. Y.*

Cheaper Plaster Models

MOST DIFFICULT part of constructing a master plaster model is aligning the templates. In master models of airplane sections, the nuts holding the assembly used to be screwed down some 10 to 15 ft. Frequently there were 100 nuts in one model, all of which had to be adjusted.

Now, an improvement suggested by Bob Maskell, model maker, saves $500 on each master model made.

Unthreaded rods used in master plaster model are welded to hold model to base

Inexpensive, unthreaded, iron construction rods and nipples with jam nuts, instead of nuts, are used to hold templates in place. When the templates for the master models are put together, it is a simple operation to slip

(Continued on page 42)

Before Specifying Industrial Gas Meters, Check this List and Table

WITH THE VARIETY of industrial gases now in use and the practice of metering as a means of gas inventory control, the question arises of what type of meter is necessary for a particular application. The following checklist includes gases that can be metered with standard instruments, and those requiring special meters.

1. Inert Gases. Practically all of the inert gases (neon, helium, argon, etc.) can be metered by a meter of standard construction. Meter capacity will vary from gas to gas due to difference in density; the lighter the gas, the greater the meter capacity must be.

2. Contaminated Gases. Special precautions must be taken in the construction of meters used for gases having high ammonia, sulphur and moisture content, otherwise corrosion of internal meter components will destroy the accuracy of the meter.

3. Combustible Gases. Since combustible gases are generally lighter than air, it is particularly important that a leak-proof meter construction be specified for this application.

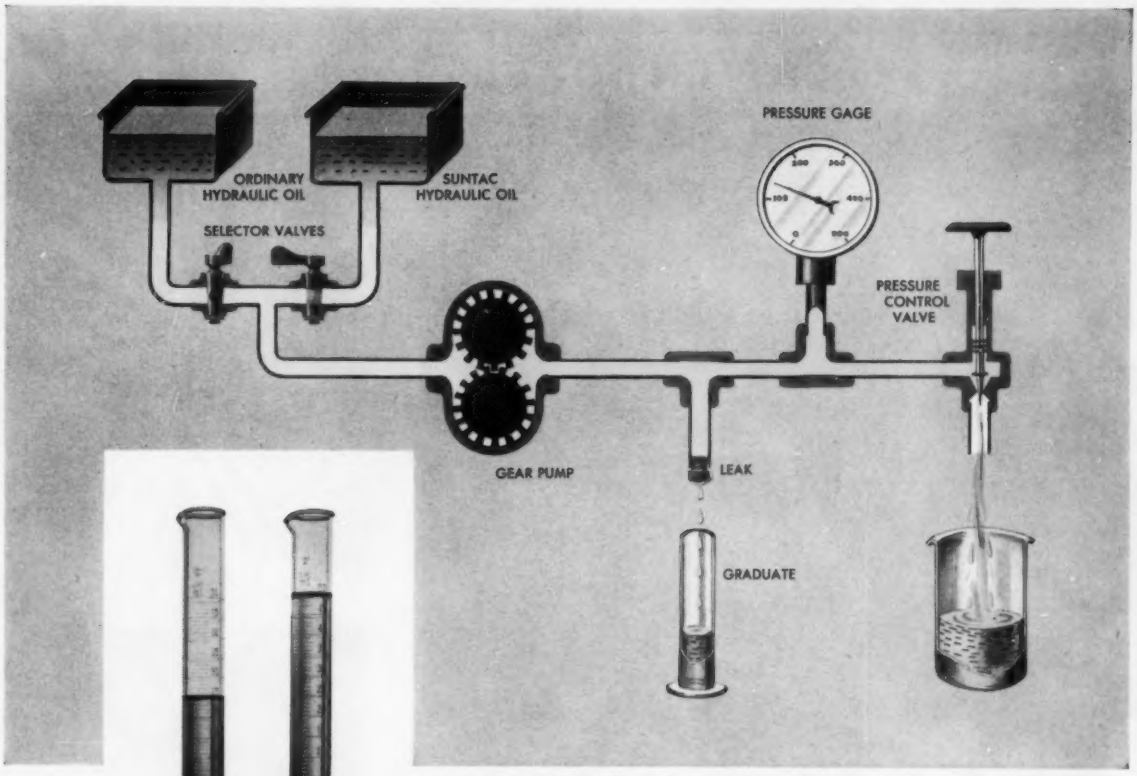
4. Oxygen. Meters for this application must be specially constructed so that no oil, grease or dirt can come in contact with the oxygen vapor. Combination of the gas with grease can form a dangerously explosive mixture. Special coatings, cleaning solutions and other precautionary steps are required in the manufacture and assembly of this class of meter.

5. Sewage Gases. Because of the high sulphur and water content of sewage gases, meter parts must be of special materials or must receive protective treatment prior to assembly.

6. LPG. With the exception of the diaphragm dressing, meters used to measure liquefied petroleum gases are of standard construction. Propane and butane tend to leach from the standard leather diaphragms, so special oil-treated leather or synthetic materials are used in these meters. *From a release of Rockwell Manufacturing Company, Pittsburgh, Pa.*

Table shows those industrial gases which require special meter construction

Type of Gas	Condition of Gas Wet (0.2%)	Dry	Construction Specification	Diaphragm Specification
Ammonia	x	x	any but brasses and bronzes	synthetic
Carbon dioxide	x	x	all satisfactory	leather or synthetic
Chlorine	cannot be metered	x	all satisfactory	natural rubber
Coke oven	tar must be removed		special handling	special oil treated leather
Freon		x	all satisfactory	leather or synthetic
Freon	x		all but iron and steel	leather or synthetic
High sulphur	x	x	all but brasses and bronzes	synthetic
Hydrogen sulphide		x	all but brasses and bronzes	synthetic
Hydrogen sulphide	x		all but iron and steel	synthetic
Sulphur dioxide		x	all satisfactory	Butyl rubber



The leak rate of ordinary oil vs. Suntac was measured in test machine simulating a typical leak in a hydraulic system. Oil viscosities were equal, time and pressure conditions identical. The simple act of switching from the ordinary oil to Suntac, *without any other changes*, reduced oil leakage by 50%.

PRESSURE SYSTEM DESIGNED TO LEAK PROVES SUNTAC CUTS OIL LOSSES UP TO 50%

If you're having troubles with excessive oil leakage, a Suntac® oil can help you. Because of their unusual anti-leak characteristics, Suntac oils reduce oil consumption up to 90%, users report.

Suntac oils will not gum up or otherwise harm circulating systems. These oils are high-quality petroleum products with a life expectancy longer than that of ordinary hydraulic and circulating oils.

A change to a Suntac oil can lower your oil costs... improve housekeeping... result in safer working conditions.

Your Sun representative can tell you more about Suntac oils. Or write for Technical Bulletin 23. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-6.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

©SUN OIL CO.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

For more facts circle 528 on Reply Card

Clevite caters to "special people" with COTTON TOWELS*

*Fairfax Towels used by Clevite Corporation are supplied by The Independent Towel Supply Co., Cleveland, Ohio

• The Cleveland Graphite Bronze Company, largest division of Clevite Corporation, is not only a leader in the design and manufacture of automotive and aircraft bearings, but also has one of the finest reputations for forward-looking employee relations. The basis for their recognition, in this area, is simply their high regard for all of their 3,500 Cleveland employees—all "pretty special" and all deserving of special treatment, including the "at home" comfort of cotton towels.

While the company stresses the importance of personnel relations, they also point to the use of cotton towels in all their plant and office washrooms as a practical maintenance and economy measure: cotton towels reduce fire hazards, improve sanitary conditions, at lower cost.

Why not follow the lead of progressive management—give the towel job to cotton in your office building, plant or institution. For free booklet on how cotton towel service will help you, write Fairfax, Dept. P6, 65 Worth St., New York 13, N. Y.

Here's How Linen Supply Works . . .

You buy nothing! Your linen supply dealer furnishes everything at low service cost—cabinets, pickup and delivery, automatic supply of freshly laundered towels and uniforms. Quantities can be increased or decreased on short notice. Just look up LINEN SUPPLY or TOWEL SUPPLY in your classified telephone book.

Clean Cotton Towels . . .

Sure Sign of Good Management

Fairfax Towels

A PRODUCT OF WEST POINT MANUFACTURING CO.

WELLINGTON SEARS CO., SELLING AGENTS, 65 WORTH STREET, NEW YORK 13

For more facts circle 529 on Reply Card

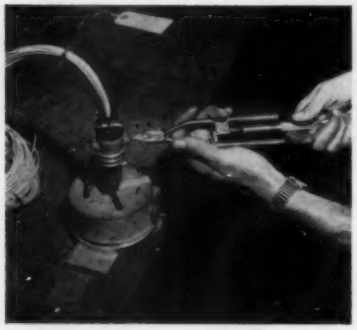
PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

the nipples front and back as the rod passes through each template. As the templates are located in their approximate places, the jam nuts are tightened to put them in correct alignment. When properly aligned, the nipples are spot welded to the iron rod and remain in a fixed position. The rods can also be welded to the model base to anchor the model firmly. *From Lockheed Southern Star, published by Georgia Div., Lockheed Aircraft Corporation, Marietta, Ga.*

Holder for Wire Assembly

ATTACHING screws and safety wire on the mechanical end of a wire assembly is accomplished 25 per cent faster with a holding device developed



Screws and wire are attached to assembly held in shop-designed device

in our shop, than by previously-used methods.

The wire assembly is plugged into a tool which has a T pin handle. The tool is inserted into a wooden receptacle, rotated and indexed to suit the worker. The holding unit is portable, and is attached by a thumb screw to a table or work bench. *From a release of Glenn L. Martin Co., Baltimore, Md.*

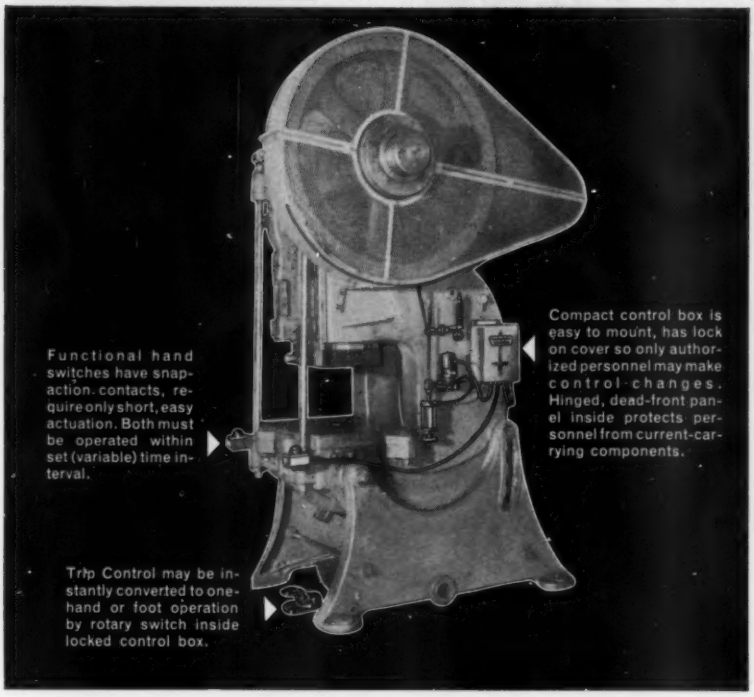
Three Batteries to a Truck

ONE REASON for the success of Ohio Boxboard Company, Rittman, Ohio, in achieving low-cost battery life of 6½ to 8½ years, is that there are three batteries for each of the 77 industrial trucks used in the plant. In most departments, the trucks are operated on three shifts, six and seven days a week.

On the three shift operation, one battery of the set of three belonging to each truck is in the truck, one is being charged and one is "resting" or

MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN


Functional hand switches have snap-action contacts, require only short, easy actuation. Both must be operated within set (variable) time interval.
Compact control box is easy to mount, has lock on cover so only authorized personnel may make control changes. Hinged, dead-front panel inside protects personnel from current-carrying components.
Trip Control may be instantly converted to one-hand or foot operation by rotary switch inside locked control box.

Increase production...3 ways... with MICRO SWITCH Trip Controls

MICRO SWITCH Trip Control will speed production and provide safety to the operator and equipment on any power machine that will lend itself to two-hand control.

1 Less operator fatigue: Simple direct operating motions, feather-touch finger-tip operation of the control switches, and the absence of gates, harnesses or sweeps keep the operator fresh and alert.

2 Increased operator confidence: Without worry over personal safety, operators soon develop a smooth, time-saving "load," "trip," and "unload" sequence.

3 Instantaneous electrical actuation of the clutch: Saves time on every operation.

Outstanding safety features

Reduces chance of accidental operation. Operation can result only when control system is functioning properly. The control becomes inoperable if a component fails.

Control cannot be "cheated" for even one stroke: If one switch is tied down or broken, the control will automatically kick out.

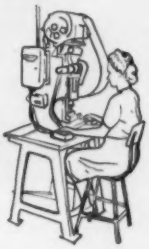
Interlock prevents accidental power stroke during set-up. Operators, set-up men, and expensive dies are protected during set-up. The interlock prevents an unexpected stroke when the motor is started up again.

MICRO SWITCH Trip Controls have wide range of uses

These controls offer a choice of desirable single-stroke control for positive mechanical clutch machines and automatic cycling control for friction clutches and hydraulic and pneumatic equipment.

FOR SMALL PRESSES

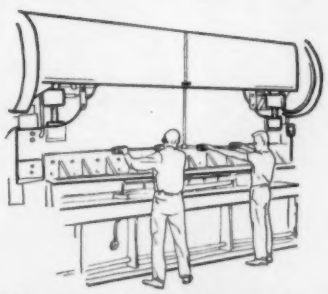
Provides fast, safe, effortless operation of small two-hand presses, riveting machines, etc.



ONE HAND—IF NECESSARY

Where one hand is required to hold stock in a protected or enclosed die, control is quickly converted to one-hand operation.

FOR USE ON LARGE PRESSES



Makes operation of large presses safe and less tiring. Any number of operator stations may be "wired into" the control circuit.

SEND FOR CATALOG 65 TODAY
Gives complete description of all controls and clutch actuating equipment.

There is a MICRO SWITCH Trip Control distributor near you. Write us for his name and address.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

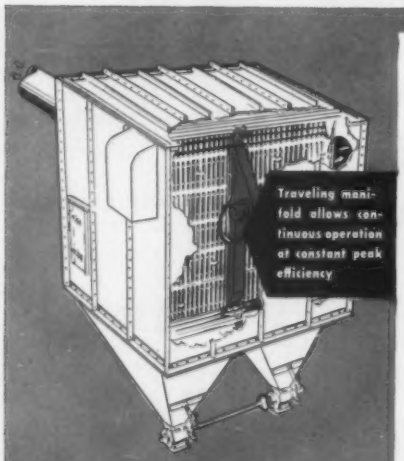
In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

For more facts circle 530 on Reply Card

For Efficient Continuous Dust Control

U. S. GYPSUM CO., St. Paul, Minn., manufacturers of building materials, occasionally operates for 120 hours at a stretch. The nature of the work permits no shut-down of dust collecting equipment during this time. For continuous and effective dust control, U. S. Gypsum uses a Pangborn Self-Cleaning Cloth Screen Collector. It meets all production requirements, keeps employee morale and efficiency high, and salvages 40 cu. ft. of powdered material for re-use during an average 8-hr. shift.

Pangborn Self-Cleaning Dust Collector



The Pangborn Self-Cleaning Collector combines the proved efficiency of the cloth screen collector with continuous automatic operation. A manifold with integral blower slowly traverses the clean air outlets of the screen frames. Covering three rows of screens at any given time, it applies a reverse air current through the center row to remove collected dust from the cloth surfaces. The result is continuous operation providing constant air volume and suction with high collecting efficiency, but operating at lower cost and requiring less space.

Pangborn CONTROLS DUST

If *your* operations require efficient, *continuous* dust control, write for details on the Pangborn Self-Cleaning Dust Collector. Send for Bulletin 915 to PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment.*

For more facts circle 531 on Reply Card

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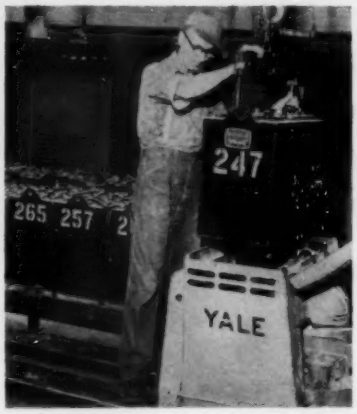
cooling off ready to be put into the truck on the following shift.

Having an adequate number of batteries for the work load insures that they are adequately charged when placed in operation and that there is sufficient time for routine cleaning and



Batteries from small trucks are lifted by hoist to a battery charging rack

maintenance. Each battery is used only in the truck to which it is assigned.

All battery charging, maintenance and repairing is under the direction of the electrical foremen, with two men maintaining the batteries during the day shift. Equipment and spare parts are available. Water lost through evaporation is replaced by distilled water from a plant still and is dispensed to the batteries from a portable tank. Large batteries for the rider-type trucks are handled at the charging station by a stationary hoist. Smaller batteries used in powerized floor trucks are handled by a hoist which reaches all parts of the charging rack. *From Gould Battery News, published by Gould-National Batteries, Inc., Trenton, N. J.*

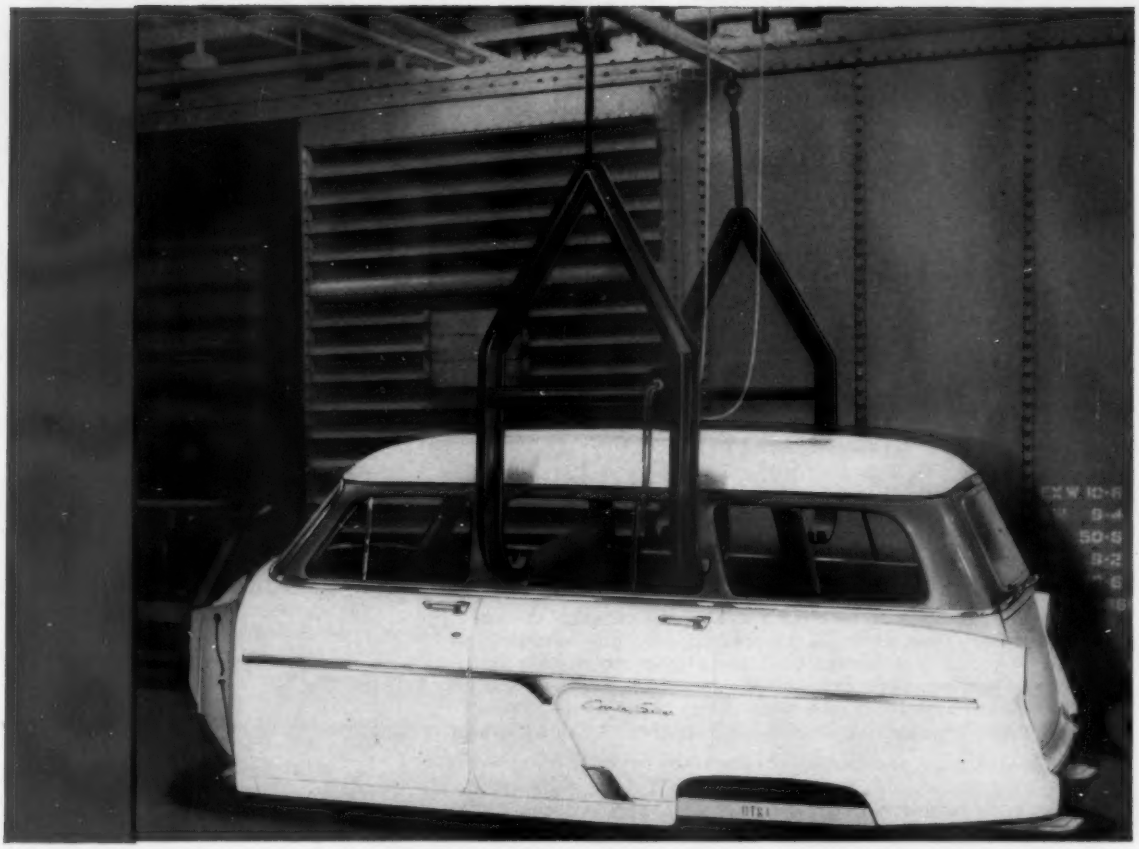
In-Plant Drivers Licensed

A DRIVER licensing program which is helping 400 drivers to regard their fork trucks as vehicles, rather than scooters, has been organized by the safety department in the Automotive Body Division. Drivers of all motorized vehicles including fork trucks, die trucks, sweepers, mobile cranes, etc., operating on plant property, are affected by the program.

Each employee hired as an in-plant driver is given a physical examination to determine whether or not he is

NOW MATERIALS HANDLING LEAVES NO SCARS

when EXON-based PVC cushions the grip!



CHESTER, PA. "Handle with care!" has been changed to "Handle with PVC" at the Ford plant here. And it means the same thing—only much more so.

A plastisol coating based on Firestone EXON 654 is applied to gripping and lifting surfaces. Barely more than a veneer (only 3/16" thick) this resilient PVC takes the battering of countless contacts, never mars the most brilliant finish.

Resistant to abrasion and corrosion, this tough EXON 654-based plastisol coating is made and applied by Quelcor, Inc.

This is only one of its growing list of uses . . . from carrying cars to carrying foods. When plastisol coating is used on super-market shopping carts, for instance, the basket mesh cannot cut vegetables or other produce; baskets can't be damaged by abrasion or rusted by wet foods.

Firestone

EXON®

Plastisol application methods are quick, convenient, economical. For more details, call or write:

CHEMICAL SALES DIVISION

FIRESTONE PLASTICS CO., Dept. 615H, POTTSTOWN, PA.
A Division of the Firestone Tire and Rubber Company

For more facts circle 532 on Reply Card

The new Schick plant at Lancaster, Pa., designed and built by The Austin Company, uses Sly Dust Filter to maintain a clean plant.

SLY DUST FILTER

KEEPS SCHICK PLANT DUST-FREE

When The Austin Company designed the ultra-modern Schick, Inc., plant at Lancaster, Pa., it kept worker comfort in mind — realizing that efficiency is directly tied in with pleasant working conditions. That's why a Sly Dust Filter was included as an integral part of the design.

For just as the Schick Electric Shaver gives pleasant shaves, the Sly Dust Filter provides for pleasant working conditions. This powerful unit whisks dust away from seven different points in buffing operations—claims dust *at its source* to keep plant atmosphere fresh and clean. Only clean air is emitted to the outside — an extra dividend in community good will.

The Schick plant and Schick products are expertly designed and constructed. So, too, are Sly Dust Filters; they offer important advantages in greater filtering capacity, easier bag replacement, automatic control and other features which spell low-cost operation.

The new Schick plant is another graphic example of how alert planners make use of Sly Dust Filters to improve conditions, increase efficiency. If you have a dust control problem, look to Sly — since 1874 designer, fabricator and erector of the world's finest dust control systems. Write today for Booklet No. 98, "Dust Control by Sly."

Designers and Manufacturers of: Dust Control Systems, Blast Cleaning Equipment, Tumbling Mills, Industrial Ovens.

THE W. W. SLY MANUFACTURING CO.

SINCE 1874

4600 TRAIN AVENUE • CLEVELAND 1, OHIO

OFFICES IN PRINCIPAL CITIES

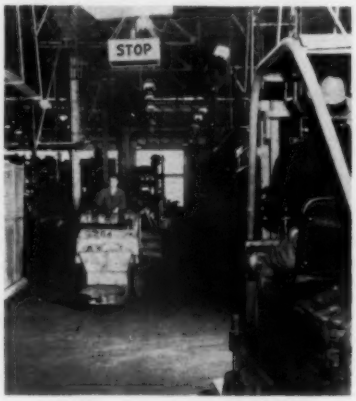
For more facts circle 533 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

capable of operating a vehicle safely. He is interviewed by a representative of the safety department to determine his knowledge of vehicle operating rules, and to interpret any rule which he does not already understand. He is also given a "road test" to determine his skill as a driver. His application for an operator's license must be approved by his supervisors.

After he is licensed, the driver operates his vehicle under rules correspond-



In-plant truck drivers take training program, observe usual highway rules

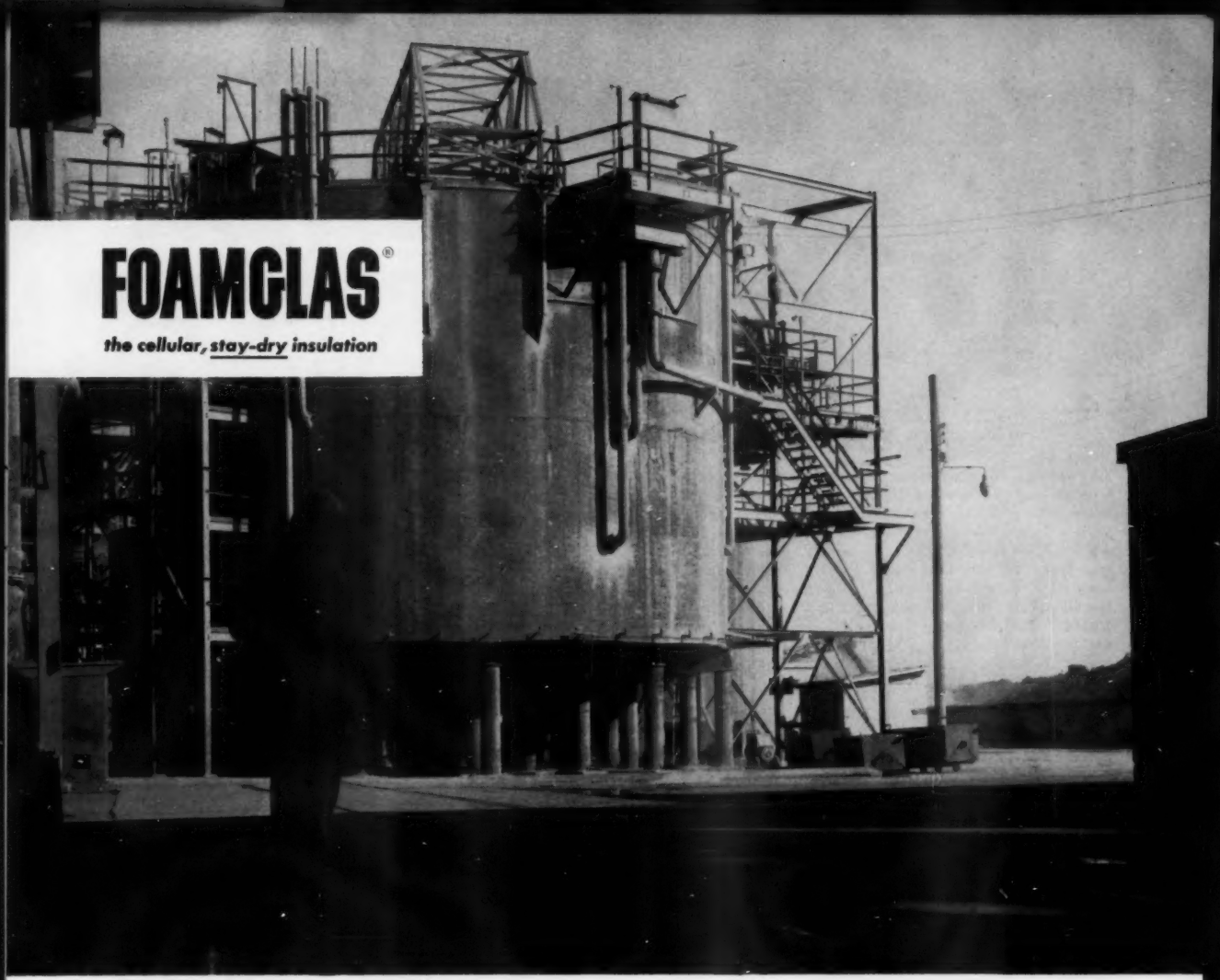
ing to public traffic laws. He is responsible for keeping his vehicle in safe operating condition and is subject to disciplinary action for infringement of plant driving rules.

In addition to licensing and qualifying drivers, the program also accomplishes the establishment of specific and detailed rules governing the use and care of vehicles; the gathering of statistics on accidents, and data which will form the basis for future safety measures. *From The Assembler, published by Automotive Body Div., Chrysler Corp., Detroit, Mich.*

Turbine Ousts Giant Engine

THE INTEGRAL air head on the governor for control of a steam turbine is being used for driving a blast furnace blower at Wickwire Spencer Steel Division of Colorado Fuel and Iron Corporation, Buffalo, New York. The new and comparatively small turbine-driven centrifugal air blower replaces an enormous, space-consuming reciprocating engine-driven unit which had been in use since 1907.

The new blower, made by Allis-Chalmers Manufacturing Company of Milwaukee, is driven by a 6020 hp tur-



FOAMGLAS®

the cellular, stay-dry insulation

At the Baton Rouge Plant of Kaiser Aluminum & Chemical Corporation

Stay-dry FOAMGLAS insulation beats humidity, prevents corrosion on process tanks and vessels

Four years ago FOAMGLAS was installed on various process tanks and vessels at Kaiser Aluminum & Chemical Corporation's Baton Rouge, Louisiana plant. They needed a moisture resistant insulating material which could withstand high and rapidly changing humidity.

Because FOAMGLAS *stays dry* it was installed on hot water tanks and sodium aluminate process vessels varying in capacity from 2000 to 400,000 gallons. The moisture-proof structure of FOAMGLAS is giving *constant insulating protection* and is effectively preventing corrosion . . . despite the severe humidity conditions. Because it's fireproof FOAMGLAS is also providing an added safety factor.

These benefits and more can be *yours* when you insulate vessels, piping, equipment or buildings with long-lasting, *stay-dry* FOAMGLAS. Write for full details. We'll be happy to send you a free sample and our latest literature pertinent to your needs.

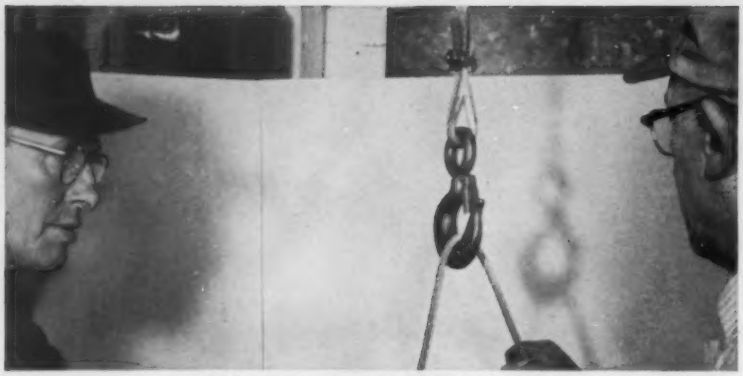
Pittsburgh Corning Corporation

Department PE-66, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto, Ontario

You can easily prove that FOAMGLAS stays dry by making this simple test. It and five other equally simple tests will quickly demonstrate the combination of properties that make FOAMGLAS the perfect solution to your insulating problems. Write now for a free sample and complete testing directions.

PC® Also manufacturers of PC Glass Blocks

For more facts circle 534 on Reply Card



LOADS STAY PUT!

Anyway you handle it—rough or easy—your load can't come off the hook when your crane or hoist is equipped with a Laughlin Safety Hook! When the load is set down, your sling or ring won't slip off the hook until *you* release it! The hook is designed to strict specifications, drop forged and heat treated. The fool-proof latch mechanism that maintains maximum throat width is made of long life stainless steel or bronze—it'll never rust, never jam!

Non-Sparking Safety Hooks are also available for your hazardous atmosphere applications. Made of forging quality bronze that's strong as steel, the entire Laughlin unit-hook, safety latch, spring, rivet and bolt—is non-sparking and highly acid and corrosion resistant too! Your Laughlin Distributor can give you the complete story.

You'll find Laughlin fittings—the world's most complete line of fittings for chain or wire rope—fully described in the new catalog now available from your nearby distributor or from: Thomas Laughlin Division, American Hoist & Derrick Co., Portland, Maine.

TAKE IT (UP) EASY

Big hex ends of Laughlin Turnbuckles make them easy, fast and safe to take up with a standard wrench. Exclusive Laughlin eye design takes the ear of a shackle one size smaller, yet is stronger than conventional eyes because it conforms more closely to the line of pull. This same design feature also makes it easier to attach thimbles and other fittings. You can get Laughlin Turnbuckles in any combination of hooks, eyes and jaws in a complete range of sizes. Leading distributors carry the complete Laughlin line!

SAFETY IS NO SECRET

You're free from worry, your workers free from danger when Crosby "Load-Rated" Crane Blocks are part of your rigging. There's no chance to overload the block by mistake because the load capacity is plainly visible on the side plate! The rated capacity *can't* be a secret when it's in sight! Industrial workers all over the country are protected by Crosby "Load-Rated" Blocks—are yours? Crosby Products Division, American Hoist & Derrick Co., St. Paul 1, Minnesota.

NEED A SLING FAST?

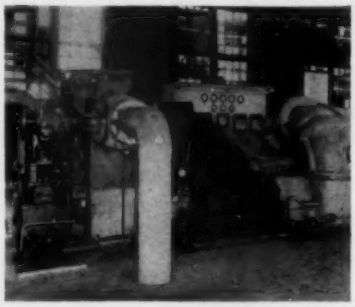
Time-consuming, expensive welding or blacksmithing is no longer necessary when coupling chains to fittings. You can make slings in minutes at lowest cost by using Laughlin's heat-treated Double Clevis Links. They'll couple ¼" to ½" standard and alloy chains to rings, end and sling links, eye hooks, pad eyes, tractor eye bolts and other fittings.

For more facts circle 535 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

bine of stiff shaft design, fabricated at our Wellsville Works. The turbine incorporates an oil relay governor with integral air head. This device regulates the steam flow through individually cam-operated multiple governor valves and provides the best control for the speed range of 2600 to 3700 rpm. First critical speed is well above maximum operating speed of 3725 rpm. Speed changes from one extreme to the other can be obtained in 30 seconds.



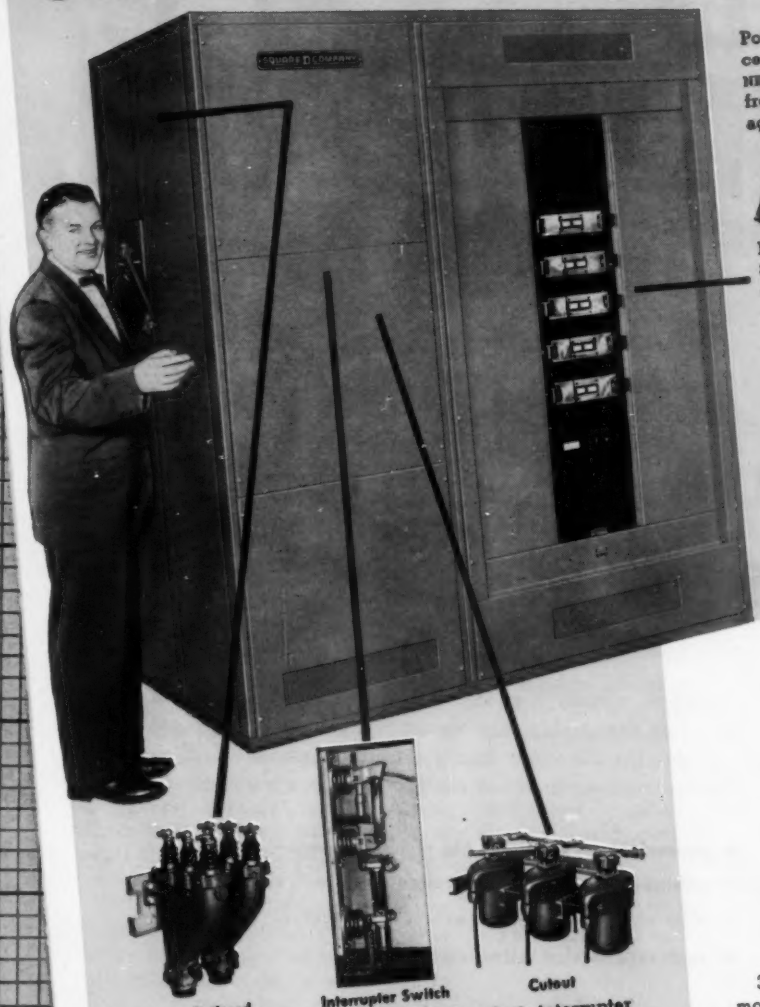
New turbine, seven feet high, twenty-four feet long, has replaced old motor

Five-story high engine compressor used since 1907 to drive the furnace blower

The new blower-turbine combination, measuring approximately seven feet high by 24 feet long, is dwarfed by its predecessor, a steam driven, reciprocating compressor extending from the basement to about the height of a five-story building. It contained a 24-foot flywheel. *From a release of Worthington Corporation, Harrison, N. J.*

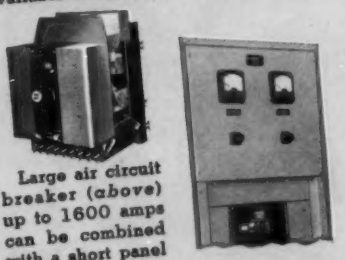
For more facts circle 536 on Reply Card →

SQUARE D's NEW Unit Substation IN POWER-STYLE CONSTRUCTION



Designed to match Square D's Power-Style switchboards and control centers, these new Unit Substations meet NEMA, ASA, and AIEE standards. Available from 75 to 500 KVA; in primary voltages up to 4800v; secondary up to 600v.

Molded case circuit breakers (*left*) up to 800 amperes and QMB Saflex fusible switches (*right*) up to 600 amperes are available in compact panel construction.



Large air circuit breaker (*above*) up to 1600 amps can be combined with a short panel in one section.

REAR VIEW

3 single phase, dry-type transformers individually mounted on base in ventilated enclosure—heating and vibration held to a minimum. Transformers easily accessible for maintenance and inspection. When no air circuit breaker or metering equipment is used, entire area at top left is available for pull box.

Pothead

Interrupter Switch

Cutout

Potheads, fused or unfused load break air-interrupter switches and fused or unfused oil-filled cutouts are available. Air-interrupter switches and cutouts are easily accessible from front of Substation.

SQUARE D COMPANY

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

Nicholson *steam trap* capacity *gives you*...

faster, more effective condensate removal

Write, today, for your copy of new Bulletin 10-55—for detailed information.

Nicholson capacity is greater than that of any other trap of the same size. And, greater capacity—right across the board—means the Nicholson trap discharges condensate and air from plant steam lines and equipment *faster*, more *effectively*.

- **powerful valve action—big husky bellows.**
- **positive shut-off—finely ground valve and seat.**
- **high capacity—effective use of large orifice.**
- **each unit service tested—with steam.**

When less than the best won't do, specify Nicholson.

NICHOLSON

W. H. NICHOLSON and Company

TRAPS • VALVES • FLOATS • METAL PARTITIONS
LAUNDRY, DRY CLEANING AND PRESSING MACHINERY

14 OREGON STREET, WILKES-BARRE, PA. • SALES AND ENGINEERING OFFICES IN 98 PRINCIPAL CITIES

For more facts circle 537 on Reply Card

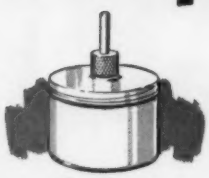
You name it-MOYNO® pumps it!

Foods

Potato salad, chow mein, peas, cream-style corn, tomatoes, molasses, chocolate.

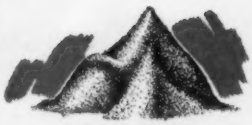
Chemicals

Caustics, acids, dyes, petroleum solvents, soaps, sludges, latex, synthetic resins.



Pastes

Paper coating, starch, seam paste, size, adhesive dope, heavy grease, graphite sludge.



Abrasives

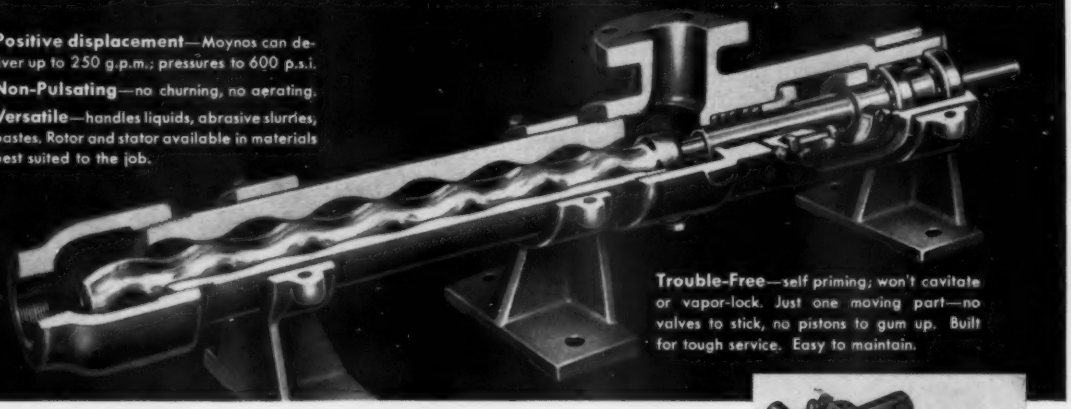
Insulator clay, frit, ground glass and water, porcelain glaze and enamel, cement, plaster.

FEATURES OF THE MOYNO THAT MAY SOLVE YOUR MATERIALS-HANDLING PROBLEM

Positive displacement—Moynos can deliver up to 250 g.p.m.; pressures to 600 p.s.i.

Non-Pulsating—no churning, no aerating.

Versatile—handles liquids, abrasive slurries, pastes. Rotor and stator available in materials best suited to the job.



Trouble-Free—self priming; won't cavitate or vapor-lock. Just one moving part—no valves to stick, no pistons to gum up. Built for tough service. Easy to maintain.

R & M Moynos handle almost anything that can pass through a pipe

The Moyno is a problem-solving pump. And whether your problem is one of materials, maintenance or flow, there's a better-than-even chance that the Moyno is the pump you're looking for.

Here is a completely different kind of pump that handles almost anything that will push through a pipe, from free-flowing liquids to non-pourable pastes—even materials containing relatively large particles or abrasives.

This is how the Moyno works: a screw-like rotor turning within a double-threaded stator creates cavities which *progress* toward the discharge end of the pump, carrying the material being handled. The result is a smooth, steady flow, free from pulsation and turbulence.

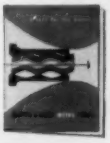
The pumping elements of the Moyno are available in a wide range of materials, depending upon the substances to be pumped. From stainless steels and synthetic rubber to tool steels, bronze, plastics—there is a Moyno that will do the job you want, and do it with remarkable efficiency.

Industrial-type Moynos are available with capacities to 250 g.p.m.; pressures to 600 p.s.i. Small Moynos (see inset), used as original equipment, serve on washers, water pumps, sprayers, and many other products.

FREE...

this informative bulletin

Tell us your pumping problem—let's see how the Moyno can help solve it. If necessary, we'll be glad to run tests for you in our own laboratories. In any case, get the details on the Moyno—mail the coupon below.



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Desk, Window, and Household Fans

Hoists and Cranes

Moyno Pumps

Propellair Industrial Ventilating Equipment

Robbins & Myers, Inc.
Pump Division, Springfield, Ohio (PE)

Please send Bulletin 30C on Moyno Pumps

Name_____ Title_____

Company_____

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City_____ State_____

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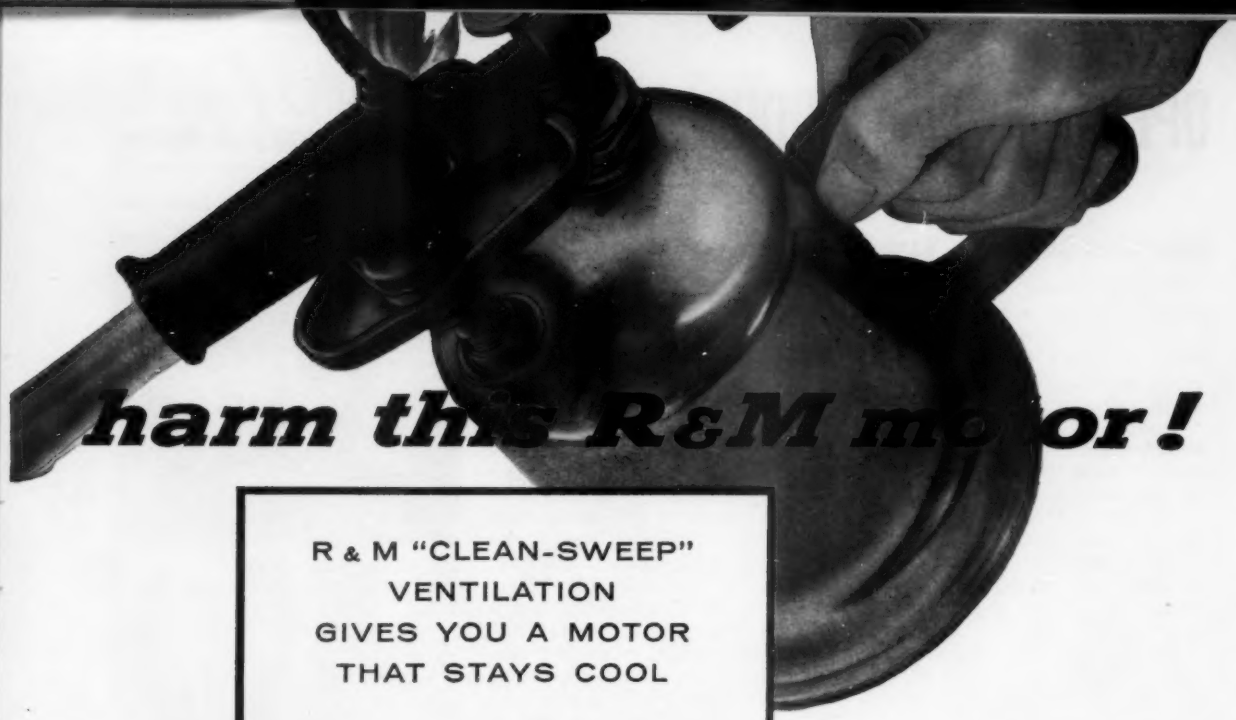
Even the blast of a
blowtorch didn't



harm this R&M motor!

R & M "CLEAN-SWEEP"
VENTILATION
GIVES YOU A MOTOR
THAT STAYS COOL

To show how R & M motors shrug off heat, a standard R & M "All-Weather" Motor was run for two hours—with a blowtorch pointed directly at it. At the end of the test you could fry an egg on the shell in seconds; surface temperature was 298° F. But *inside*—where coolness counts—temperature stayed at 167° F. Winding and insulation remained in perfect condition!

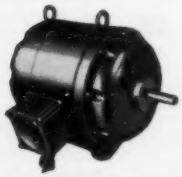
There's an important moral to this test, even though you'd never subject a motor to such extreme heat in your plant. Overloads have the same effect on a motor; so does exposure to hot sun. R & M motors are designed to circulate air at unusually high velocity—from *one end clear through to the other end.* R & M "clean-sweep" ventilation not only carries off motor heat, but also prevents build-up of dust and dirt in the cooling passages. And for extra protection, openings are screened—at no extra cost to you.

A foundry in the midwest is one of many users who swear by R & M Motors because of "clean-sweep" ventilation. One of their motors has seen 11 years of service on a blast furnace charging crane. Hot work—but the R & M motor still runs perfectly! You can expect the same top-flight service in *your* plant.

ROBBINS & MYERS, INC.

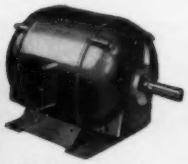
SPRINGFIELD 99, OHIO · BRANTFORD, ONTARIO

From 1 to 200 Horsepower... R&M® *if it's an* **R & M** *it's the Right Motor!*

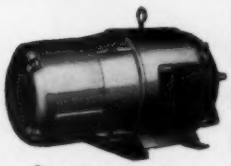


Explosion-proof totally enclosed fan-cooled 1 to 40 hp.

Frequency converters and alternators 2½ to 15 kw.



Direct current motors 1 to 7½ hp.



Capacitor single-phase motors 1 to 15 hp.

"All-Weather" is an R & M trademark

MAIL THE COUPON TODAY...
for more information on the finest motor your money can buy!

PE

Robbins & Myers, Inc., Springfield, Ohio

☐ Please send illustrated Integral Motor Catalog, showing all the extra features of R & M "All-Weather" Motors that are furnished at a standard motor price. We are also interested in:

☐ Explosion-Proof
☐ Totally Enclosed Fan-Cooled
☐ Capacitor Single Phase
☐ Frequency Converters & Alternators

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*Company*_____

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*City*_____ *Zone*_____ *State*_____

For more facts circle 539 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Nylon Tubing Survives the "Bends"

FLEXIBLE NYLON tubing of high burst rating has been found highly useful by the National Can Co., Chicago, on metalworking equipment—conveying lubricants, air, water and plastic spray.

Used on their four "Body-Maker" machines and six automatic punch presses, vastly increased tubing life (in the order of 25 times the life of other materials) has been achieved. Machine down time for tubing replacement has consequently been all but eliminated, and the use of smaller tubing and simpler connections has been found practicable.

This specially processed nylon tubing, Nylaflow, supplied by The Polymer Corporation of Pennsylvania, Reading, Pa., has an outside diameter of ¼ in., with a 0.05-in. wall and a burst rating of 2500 psi.

On the Body-Maker, turning out 400 can bodies per minute, the automatic lubrication system required a tubing which could withstand 400 flexes per minute. After rubber tubing failures, Nylaflow tubing was selected for trial, and has been in continuous service for 12 months—over 100 million flexes.

The nylon tubing is also being used for the spray tube connections. In this application, four 7-in.-long tubes supply plastic spray, compressed air and water used in the process for coating the can interiors.

Equally successful has been the use of three 12-in.-long segments of the ¼-in. tubing on each of the plant's six automatic punch presses. Two segments supply automatic lubrication from a high pressure system, and the third supplies air.

Hoppers Simplify Scrap Handling

SWITCHING from wheelbarrows and scoops to self-dumping hoppers for handling metal scrap has helped Verson Allsteel Co., Chicago, turn a time-consuming salvage procedure into a one-man operation—and make scrap segregation practical for the first time.

Verson, manufacturer of stamping presses, has to handle steel filings, turnings, cuttings and other scrap. This handling was formerly done by several men, using wheelbarrows and scoops to collect scrap and wheel it outside the plant for pick-up by scrap dealers.

With self-dumping hoppers, made by Roura Iron Works, Inc., one worker moves through the plant, shoveling scrap into several dozen of the hoppers, scattered throughout the machining areas. Full hoppers are picked up on a fork truck and carried to semi-trailers spotted outside the plant by the scrap dealers. When the hopper is raised above the trailer, the handle is pulled to release the hopper, which dumps itself and then returns to the upright position. The empty hopper is then trucked back to its station.

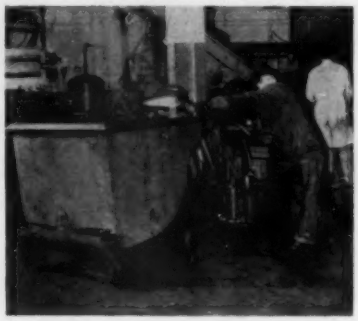


Fig. 1. One-man salvage crew shovels metal turnings into department hopper

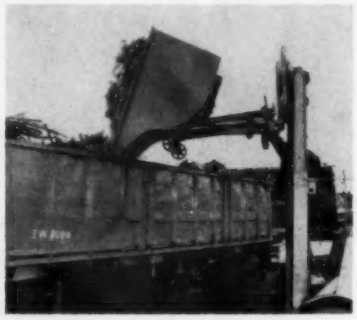


Fig. 2. Hopper, trucked to trailer spotted outside plant, dumps its scrap load

Use of the hoppers has facilitated the economic segregation of scrap, bringing about an increase in the sale value of the metal. Working areas have been departmentalized according to metals used, and hoppers are assigned to each department.

Porcelain Finish Won't Run When Fast-Dried in Infrared Oven

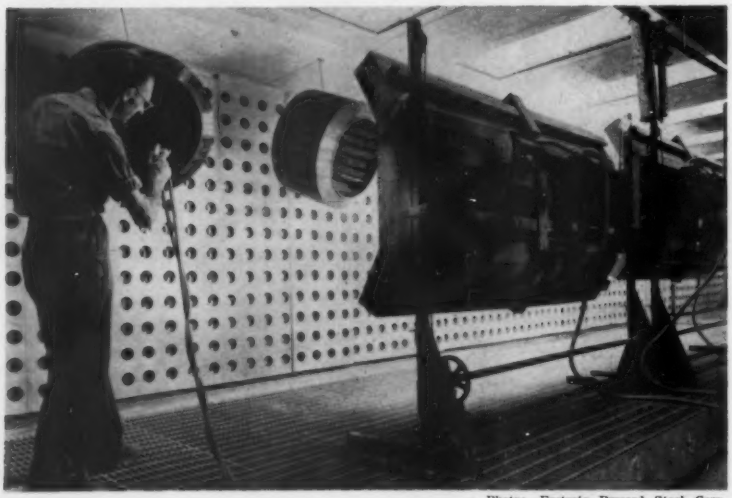


Photo: Fostoria Pressed Steel Corp.

Infrared oven is used by Westinghouse to temporarily set paint on washing machine spinners at Columbus, Ohio, plant. Heat sets frit to prevent "runs"

Direct Expansion Chiller Supplies Dehydrated Air

HEAT AND HIGH HUMIDITY can mean serious trouble if your manufacturing process depends on a supply of dry air—as does that at Tecumseh Products Co., Tecumseh, Mich., in its production of refrigeration compressors and condensing units.

Large quantities of air are needed to provide proper dehydration of these components during their manufacture and inadequacy of the air drying equipment forced shutdown of the plant during periods of high humidity.

Tecumseh's plant engineer, A. G. Wirick, developed a better method of

HOW TO USE HALLOWELL ADJUSTABLE SHELVING IN YOUR PLANT

SELECT THE BASIC SHELVING UNIT

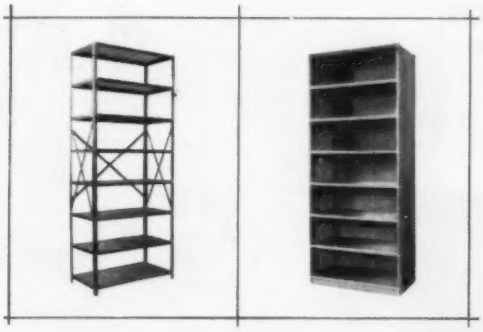
USE IT INDIVIDUALLY OR IN COMBINATION

CLIP IN DIVIDERS

ADD SLOPING SHELF UNITS AND SHELF BOXES

PUT IN DRAWER INSERTS

ATTACH SLIDING OR SWINGING DOORS



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BENCHES (CABINET, WORK, UNIT) • STOOLS AND CHAIRS • SHOP DESKS • TOOL STANDS AND CABINETS • DRAWERS, DRAWER TIERS • STEEL CARTS • SHELVING

For more facts circle 540 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

drying air, by integrating a direct expansion chiller—normally used to cool liquids—with the existing system. As a result, capacity was doubled.

Originally, the system worked in this manner: Air was heated from room temperature to 310 F in a series of large dryers. Raising the air to this temperature reduced its relative humidity to the desired point, and the excess moisture in the air was then removed by passing the air through a series of deep refrigeration coils, where the moisture condensed out.

To increase capacity of this system, additional dryers could have been installed, but the length and frequency of the peak humidity periods did not justify the cost or the plant floor space that would have been required for more equipment.

Reasoning that removal of some of the moisture before it went to the dryers would dry more air, and to a higher degree of dryness, a Dry-Ex Chiller, made by Acme Industries, Inc., was placed in the line directly ahead of the dryer.

In the new cycle of operation, room air is drawn into the system, heated to 110 F by heat of compression of an air compressor, passed through the direct expansion chiller under pressure, and cooled to a temperature of 60 F. Still under pressure, the air enters the large drier, to emerge at 310 F with the desired low moisture content. The water removed in the condensing operation is removed through a special bleed-off valve.

The air drying process requires approximately one ton of refrigeration capacity for each 100 cu ft of air passing through the chiller. To obtain this capacity, the plant used three 7½-hp systems with a capacity of 750 cfm; one 14-ton system with a capacity of 1700 cfm; and one 20-hp system with a capacity of 1900 cfm.

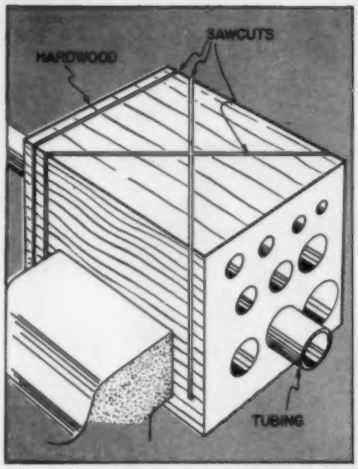
Miter Block for Tube Cutting

Contributed by F. E. Riley

MITERED RIGHT-ANGLE corners in tubing and piping systems are poor hydraulic practice, but such corners are common in building mechanical structures of various kinds from tubing and piping.

Sound welded or brazed joints can be produced if the tube ends have been sawed exactly 45 degrees to the tube axis. For general shop and maintenance work, the hand hack-saw is the quickest tool for cutting tubing, but the true 45-deg angle is somewhat difficult to attain.

A simple guide for cutting tube ends at a desired angle is a hardwood block, with saw cuts made at a right angle to each other, and cut at an angle of 45 deg to a series of holes drilled longitudinally through the block. The saw cuts intersect the holes, which accommodate tubing of various diameters. The saw blade will be held to the angle, and the mitered ends will make better joints than would ends sawed at incorrect angles.



Drilled and cut as shown, hardwood block functions as tube cutting miter

A similar difficulty exists when cutting tubing ends square, for butt joints. The wooden guide block can be used for these cuts, if a slot is cut at a right angle to the tube axis.

The tubes, when being cut, can be prevented from rotating by holding

(Continued on page 58)

Compact Units Heat Process Water for Mirror-Silvering Operation

FOUR YEARS of continuous service by two multi-fin, continuous flow, gas-fired water heaters has helped Nurre Companies, Inc., to definitely improve the quality of mirrors produced in their plant located in Memphis, Tennessee.

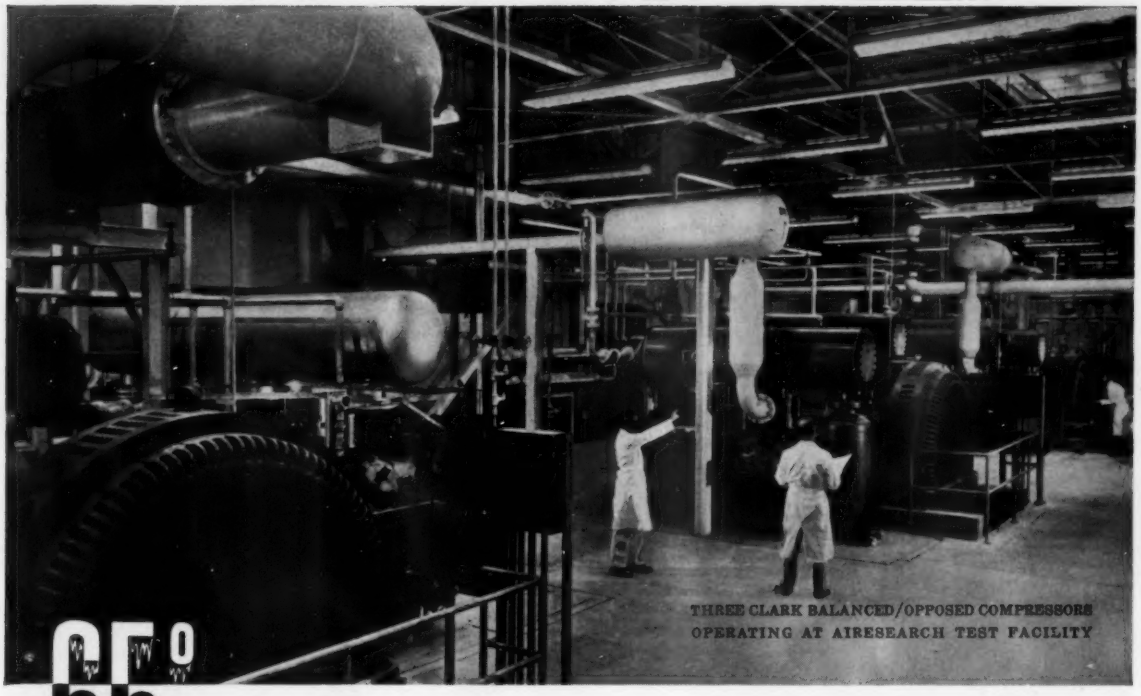
Maintaining a precisely even temperature is extremely important during the production of a mirror. To secure this temperature consistency, without interruption or fluctuation, the Nurre firm installed two Ruud gas water heaters in March 1952.

Gas-fired heaters, against wall at right, provide hot water for silvering line

One of these heaters replaced a boiler that had been positioned under the conveyor belt in the production line where nitrate of silver is applied to the glass. This unit provides water at 120 F, which is moved by a booster pump to a 10-nozzle spray arm under the conveyor belt at the start of the silvering process. The water, as a heating agent, is sprayed upward against the belt to preheat it.

The second water heater provides 120 F water to a 15-nozzle spray arm at the unloading end of the conveyor belt. This hot water, sprayed on the glass with its fresh coating of nitrate of silver, not only maintains temperature of the glass and conveyor belt, but also flushes away undesirable metallic sludge formation.

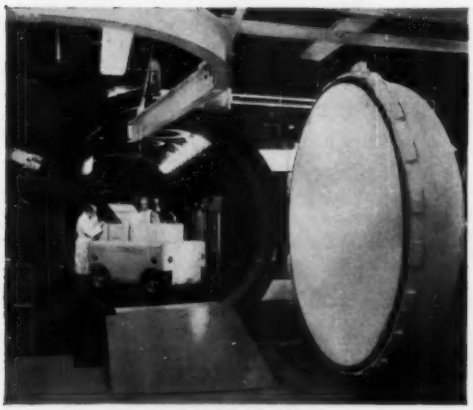
Each of the water heaters, manufactured by Ruud Manufacturing Co., provides about 1,060 gal of water, at 120 F, each 8-hr work day.



THREE CLARK BALANCED/OPPOSED COMPRESSORS OPERATING AT AIRESEARCH TEST FACILITY

65° below zero in the middle of the desert

Clark Air Compressors furnish the power



GIANT ALTITUDE CHAMBER FOR HOT AND COLD TESTS

Mass production testing of aircraft components such as air turbine starters, refrigeration turbines and other units was what the AiResearch Division of the Garrett Corporation wanted. To meet this need, they built giant test facilities next to their factory in the middle of the Arizona desert at Phoenix featuring seventy-five test cells.

To provide most of the air to operate test equipment AiResearch installed three Clark Model CRA-4 Balanced/Opposed Motor-Driven-Compressors having a combined rating of 4750 horsepower. Up to 42 tons of air per hour can be delivered. Temperatures range from a frigid −65° to a blistering 1000°F while pressures of from vacuum to 1000 psi can be provided.

For your air needs in the 150-4500 horsepower range, Clark has an ultra modern Balanced/Opposed Compressor to fit every application. Your nearest Clark representative will give you complete information or write for Bulletin 118.

CLARK BROS. CO., OLEAN, N. Y.
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Balanced/Opposed Air Compressors

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SAFE HOISTING

THAT PAYS OFF IN SAVINGS

Safe hoisting demands more than devices to protect man, load and hoist. Equally vital are *invisible values:* experienced engineering, careful selection of materials, precision manufacture and thorough tests.

The Series "600" 'Load Lifter' Electric Hoist has *two* powerful, automatic brakes. Each alone can hold the full load. Modern 'Load Lifter' Hoists were first to have safe 24 volts at the push buttons. Steel suspension, tough wire rope and non-fracturing load hook provide extra strength for heavy-duty service. All operating parts are enclosed, but the hoist can be serviced safely *in the air.*

Safety . . . quality . . . performance — the Series "600" 'Load Lifter' Electric Hoist is "okay on every count." It is fast — lifts 1000 lbs. at 30 FPM. Sizes: ½ and 1-ton. All types of suspension, including motorized trolley. *Call your "Shaw-Box" Distributor or ask us for Bulletin 408.*

MAXWELL MANNING M&M & MOORE INC. TRADE MARK

'Load Lifter'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.

MUSKEGON, MICHIGAN

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Makers of 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

For more facts circle 542 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 54)

them manually, or with a lathe dog clamped to the protruding tube end. Also, dropping the block down into the vise jaws will result in the pressure of the vise deforming the block enough to grip the tubing.

Camera "Stops" Test Pattern

TESTING of missile components at Northrop Aircraft, Inc., includes the use of an accelerometer to determine the component's ability to withstand shock.

In one of the tests, a pendulum is released to strike a resonant mass

Operator prepares to open shutter of polaroid camera to record impact pattern

(upper right in photograph) which contains a standard accelerometer on the impact end and an unknown value accelerometer on the opposite end.

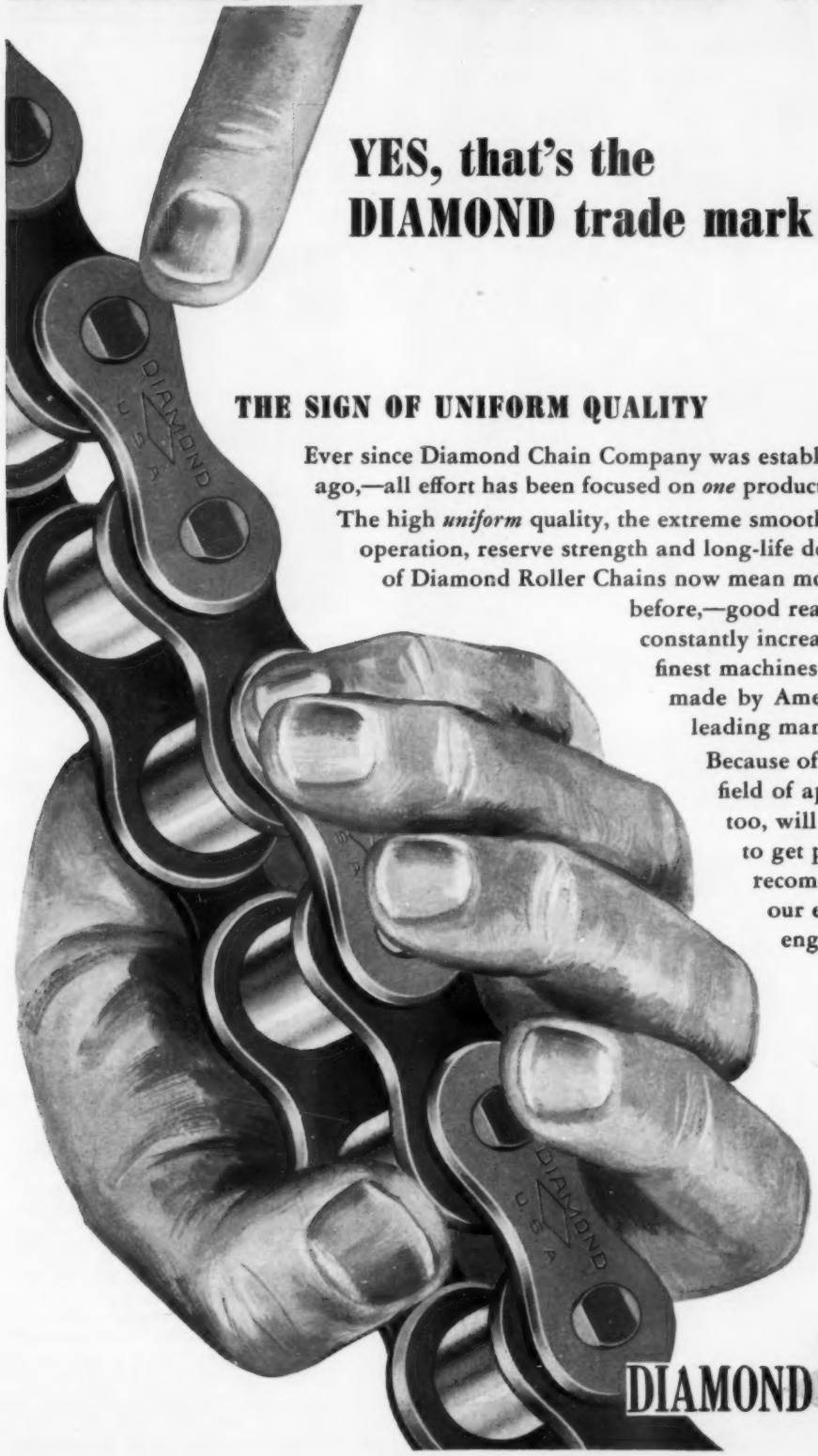
Comparison of the behavior of the two accelerometers is indicative of the suitability of the component in question. This comparison is made on a dual-beam oscilloscope, which records curves from both accelerometers at the moment of impact.

Interesting phase of the test is the method used to record the oscilloscope pattern. A polaroid camera, mounted on the oscilloscope and focused on the screen, gives an almost immediate pictorial evaluation of the test results.

Masonite Replaces Steel In Template Construction

REPLACEMENT of steel with laminated Masonite for punch press templates is a recent development of the Ingersoll-Rand Co., at their Painted Post, N. Y., plant. Insertion of Heli-Coil stainless steel wire thread inserts

DIAMOND ROLLER CHAINS



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Ever since Diamond Chain Company was established over 65 years ago,—all effort has been focused on *one* product,—Roller Chain.

The high *uniform* quality, the extreme smoothness of operation, reserve strength and long-life dependability of Diamond Roller Chains now mean more than ever before,—good reason for their constantly increasing use on the finest machines and equipment made by America's leading manufacturers.

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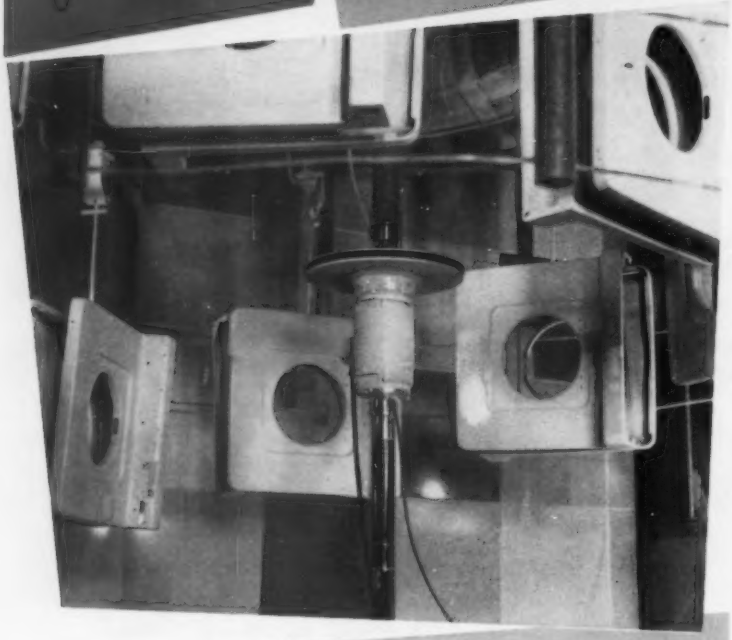
for the first time...

PORCELAIN ENAMEL
is being applied successfully—
Yes, even spectacularly—
with RANSBURG NO. 2
ELECTROSTATIC SPRAY
PROCESS



General Electric—an extensive user of Ransburg Electro-Spray for painting with synthetic enamels—is the first to use Ransburg No. 2 Process in the application of porcelain enamel.

GE—less than a year in electrostatic production—now is processing almost a million square feet of cover coat each month in the General Electric Home Laundry finishing department at Appliance Park.

DRYER TOPS AND WASHER COVERS ARE BEING COATED ELECTROSTATICALLY WITH THESE SPECTACULAR RESULTS

Quality of appearance and chip resistance are greatly improved with all colors: white, yellow, pink, turquoise, blue and brown.

About 97% of the atomized enamel is deposited on the washer and dryer parts.

Because of improved uniformity in coating thickness, weight of applied enamel was substantially reduced.

Because of lower application weight, the few rejected parts can be re-processed more times before being scrapped. This reduces the ultimate scrap rate by at least 95% of that previously expected.

Efficiency, measured by the amount of good ware, averages above 90%.

Want your products tested?

Ransburg has fully equipped laboratory facilities including reciprocating disks, helical conveyors, stationary disks, and the latest advancements in equipment for applying porcelain enamel with the No. 2 Electrostatic Spray Process. Manufacturers are invited to send sample products to our Indianapolis laboratories for tests and demonstrations to prove for you the advantages and benefits of electrostatic spray application of porcelain enamels.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana
RANSBURG

For more facts circle 544 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

into drilled and tapped holes in the Masonite template provides threads strong enough to hold the metal punches in position.

In the application at Ingersoll-Rand, sheet metal, ranging in thickness from 20 gage to 3/16 in., is punched with holes ranging from 3/32 in. to 2 in.

Threaded inserts are turned into drilled and tapped holes in Masonite template

in diameter. Templates are either 3 ft by 8 ft or 3 ft by 10 ft by ¾ in. thick, and one template may have as many as 25 punches fixed to it, each held by one or two machine screws.

Total cost of punch templates has been cut from $200.00 to $80.00 each, since the Masonite application was introduced, and the weight of the templates has been reduced to 1/6 that of those formerly used.

The templates are laminated of three ¼-in. slabs glued together. Holes for the wire thread inserts are drilled, rough and finish tapped, and the inserts are threaded into position. The inserts used in this application provide ½-13 by ¾ threads.

Fishing Reel Approach To Coil-Winding Supply Problem

CONVERSION of its coil-winding department from "casting reel" to "spinning reel" methods has led Minneapolis-Honeywell Regulator Co. to expect a $15,000 annual saving for the department.

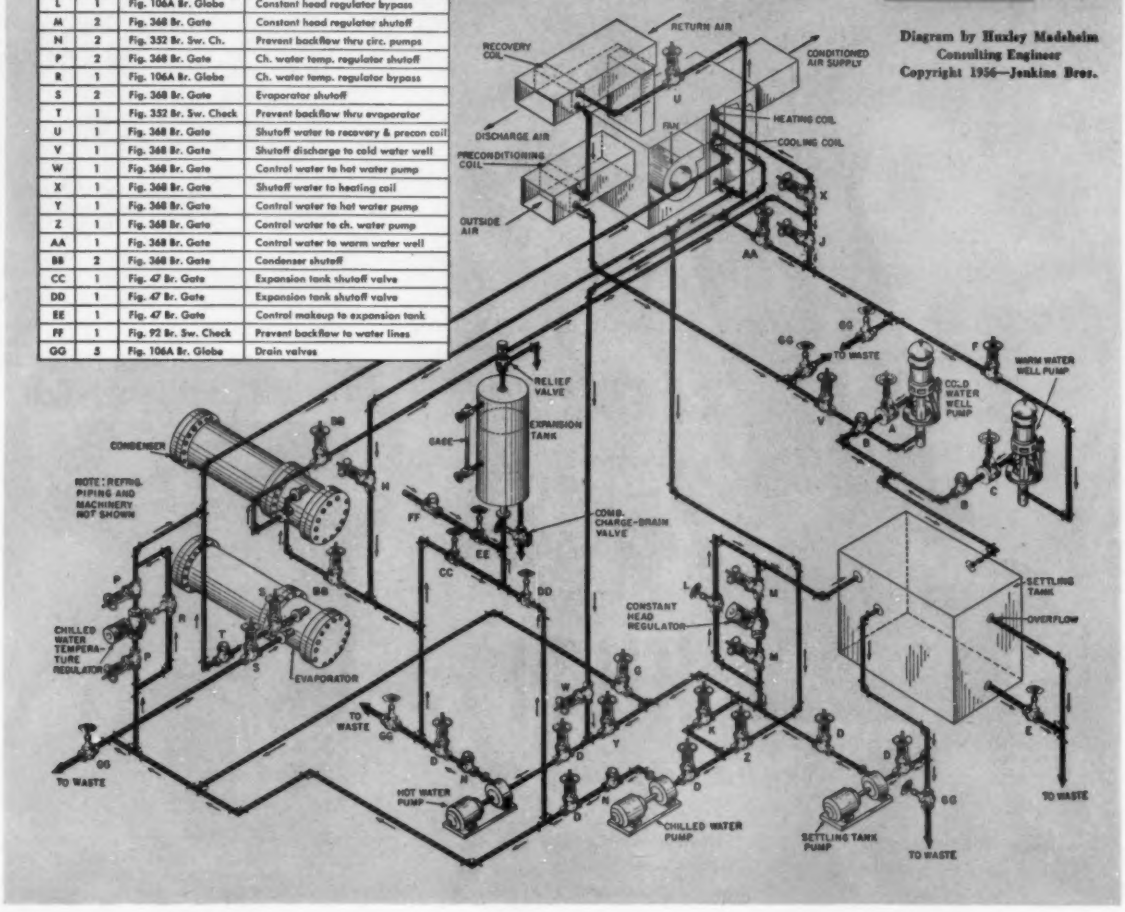
The department consumes 2½ tons of wire daily, winding it onto precision electrical coils for relays, transformers, motors, thermostats and other electrical devices. The wire, as received, is coiled in loops like rope, in special 100-lb pails (much like a spinning

JENKINS PRACTICAL PIPING LAYOUTS

77

Diagram by Huxley Madsheim
Consulting Engineer
Copyright 1956—Jenkins Bros.

Code	Quan.	Jenkins Valve	Service
A	1	Fig. 677A Br. Gate	Cold water well shutoff valve
B	2	Fig. 295 Br. Sw. Check	Prevent backflow thru well pumps
C	1	Fig. 677A Br. Gate	Warm water well shutoff valve
D	6	Fig. 368 Br. Gate	Circ. pump shutoff valves
E	1	Fig. 106A Br. Globe	Settling Tank drain valve
F	1	Fig. 368 Br. Gate	Shutoff discharge to warm water well
G	1	Fig. 368 Br. Gate	Control water to evaporator
H	1	Fig. 368 Br. Gate	Control water to condenser
J	1	Fig. 368 Br. Gate	Control water to warm water well
K	1	Fig. 368 Br. Gate	Control water to ch. water pump
L	1	Fig. 106A Br. Globe	Constant head regulator bypass
M	2	Fig. 368 Br. Gate	Constant head regulator shutoff
N	2	Fig. 332 Br. Sw. Ch.	Prevent backflow thru circ. pumps
P	2	Fig. 368 Br. Gate	Ch. water temp. regulator shutoff
R	1	Fig. 106A Br. Globe	Ch. water temp. regulator bypass
S	2	Fig. 368 Br. Gate	Evaporator shutoff
T	1	Fig. 332 Br. Sw. Check	Prevent backflow thru evaporator
U	1	Fig. 368 Br. Gate	Shutoff water to recovery & precon coil
V	1	Fig. 368 Br. Gate	Shutoff discharge to cold water well
W	1	Fig. 368 Br. Gate	Control water to hot water pump
X	1	Fig. 368 Br. Gate	Shutoff water to heating coil
Y	1	Fig. 368 Br. Gate	Control water to hot water pump
Z	1	Fig. 368 Br. Gate	Control water to ch. water pump
AA	1	Fig. 368 Br. Gate	Control water to warm water well
BB	2	Fig. 368 Br. Gate	Condenser shutoff
CC	1	Fig. 47 Br. Gate	Expansion tank shutoff valve
DD	1	Fig. 47 Br. Gate	Expansion tank shutoff valve
EE	1	Fig. 47 Br. Gate	Control makeup to expansion tank
FF	1	Fig. 92 Br. Sw. Check	Prevent backflow to water lines
GG	5	Fig. 106A Br. Globe	Drain valves



How to plan piping connections for all-year

AIR CONDITIONING WITH THE HEAT PUMP

Well water is used in the basic heat pump installation illustrated. Such a system could readily serve a building with several exterior and interior zones, which would have many air handling units. For simplicity, only one unit is shown in the diagram.

For heating demands, this system provides a closed circuit consisting of hot water pump, condenser, and heating coil. For cooling, a second closed circuit consists of chilled water pump, evaporator, and cooling coil.

During the heating season, water is supplied to the settling tank from the warm water well (about 60° F). It is circulated by the chilled water pump to the evaporator, and then to the cooling coil to provide cooling, where needed, for interior areas. The water then flows to the recovery coil, picks up heat from waste air and carries it to preconditioning coil, where it is used to preheat outside air. The resulting chilled water is discharged to the cold water well.

During the intermediate seasons, water is supplied to the settling tank from the cold water well (about 50° F). It is circulated by the hot water pump to the condenser, and then to the heating coil to provide heat, where needed, for the exterior zones. The water is then discharged to the hot water well.

During the cooling season, water from the cold water well is pumped to the settling tank, and then circulated to the evaporator and the cooling coils. It is next used to cool the condenser, and is then discharged to the hot water well. If the demand for cooling is low, and the well water cold enough, the evaporator may be bypassed.

Consultation with accredited piping engineers and contractors is recommended when planning major piping installations.

Enlarged diagram and full description of this layout free on request. Ask for Layout No. 77. Jenkins Bros., 100 Park Ave., New York 17.

JENKINS VALVES
LOOK FOR THE JENKINS DIAMOND
SINCE 1864
Jenkins Bros.

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THE *SAFE* DRIVE TOOL

Drive Hilti precision "Conic"® studs and pins with a hammer . . . no explosives required. Penetrates concrete, masonry, brick . . . steel up to 5/16". Ideal for light and medium fastening!

Hilti "Conic"® studs and pins are precision engineered to develop maximum holding power. Hilti's exclusive conical design with a ballistic point assures 300 to 800 lbs. pull-out resistance.

The new Hilti DeLuxe unit features a metal tool chest — the DM6 Universal Tool, 3 rams, 3 penetration control rings, 2 sets of jaws, a 2½ lb. hammer, and a key for ¼" hex nuts. Other Hilti units for special purposes.

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HILTI RAPID FASTENING SYSTEMS, INC.
55 VAN DAM STREET • NEW YORK 13, N. Y.

FIRST IN THE WORLD

HUNDREDS OF THOUSANDS IN DAILY USE

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OPERATION—PRODUCTION

(O and P begins on page 54)

reel). It passes through a special tensioning machine prior to entering the winding machine.

Previously, the wire was wound on spools (the casting reel) weighing from five to 15 lb each. Operators would use and replace 60 to 70 spools a day.

Currently, twelve of the firm's 16 machines have been converted to the new spinning method. The savings are expected to accrue from reduction of waste, which amounts to less than five feet per pail; increased production, up from 270 to 320 coils per hour per machine; savings on handling and the costs of shipping empty spools back to suppliers.

"Portable" Truck Counterweight

Photo: Clark Equipment Co.

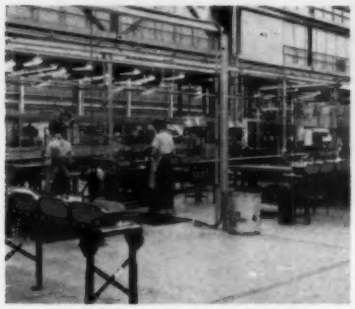
Counterweight on gas-driven fork lift truck is easily removed and hoisted out of the way for maintenance on radiator, muffler, and steering mechanism

Multi-Purpose Storage Boxes

STANDARDIZATION on one type of box, for storage in fabrication and sub-assembly load areas as well as throughout the various production areas, has reduced rehandling of parts, simplified inventory control and made possible more efficient workplace supply at the Tulsa, Oklahoma, plant of Douglas Aircraft Co. In addition, the company has found that the space-saving nesting-stacking feature of the NesTier containers has recovered "lost" floor space, making it available for production operations.

The same boxes employed throughout production are used to store in-process parts. When the NesTier containers, which are manufactured by the Chas. Wm. Doepke Manufacturing Co., are tiered as storage containers,

(O and P begins on page 54)



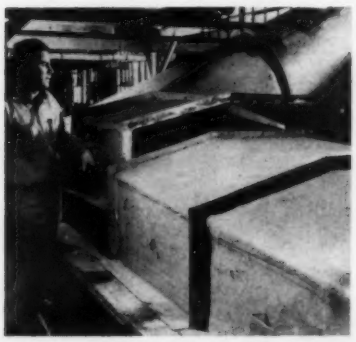
Workpieces and sub-assemblies are easily routed throughout plant areas, in containers that ride roller conveyors.

their contents are both visible and accessible. Because they are easily handled on roller and wheel conveyors, parts can be quickly dispatched to other operations.

Protective "Veil" for Laminates

CAPABLE OF IMPROVING the resistance of low pressure glass-reinforced plastic laminates to chemicals and abrasion, a new process utilizes a surface veil or overlay of Dynel fabric on either or both sides of the laminate.

One of the most chemically resistant of the science fibers, Dynel is produced by Carbide and Carbon Chemical Co. from a copolymer of vinyl chloride and acrylonitrile.



Plastic laminate hood, with surface veil protection, is easily handled

A successful installation of the overlay was made by the Pla-Tank Div. of Haveg Industries, Inc., at the Wallingford Steel Co., Wallingford, Conn. Here, a polyester-glass fiber laminate stack and exhaust hood installation has withstood the corrosive action of hydrofluoric and nitric acid fumes for two years, since it was covered with an overlay.

DOUBLE MECHANICAL SHAFT SEALS

PERMANENTLY LUBRICATED BALL BEARINGS

These two advanced features of

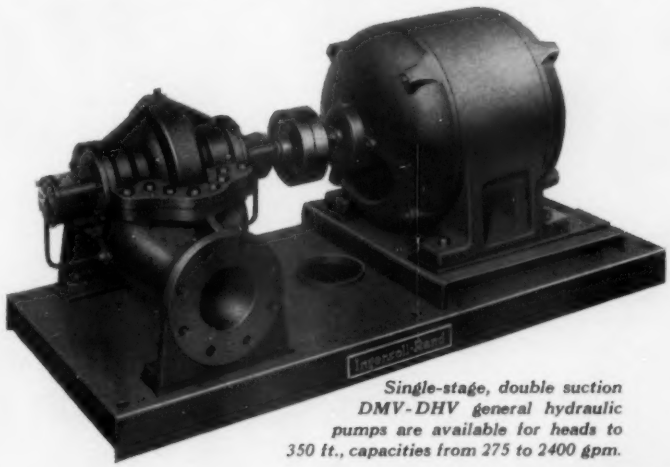
DMV-DHV PUMPS

end pump maintenance problems

Used in place of conventional packed stuffing boxes, Double Shaft Seals eliminate the need for periodic inspections and repackings. Performance-proved and self-adjusting, they require no attention throughout their entire service life.

Sealed, Cartridge-Type Ball Bearings do away with the necessity of greasing or oiling pump bearings. Here, in the DMV-DHV pump, the bearing lubricant is permanently sealed in—and assures years of successful operation.

You can install this modern I-R pump anywhere due to the greater compactness obtained with this modern construction. It is the simplest, most maintenance-free pump ever built by Ingersoll-Rand for general hydraulic service. Write for Bulletin 7248-A, or see your nearest I-R branch office.



Single-stage, double suction DMV-DHV general hydraulic pumps are available for heads to 350 ft., capacities from 275 to 2400 gpm.

Ingersoll-Rand

10-288

Cameron Pump Division
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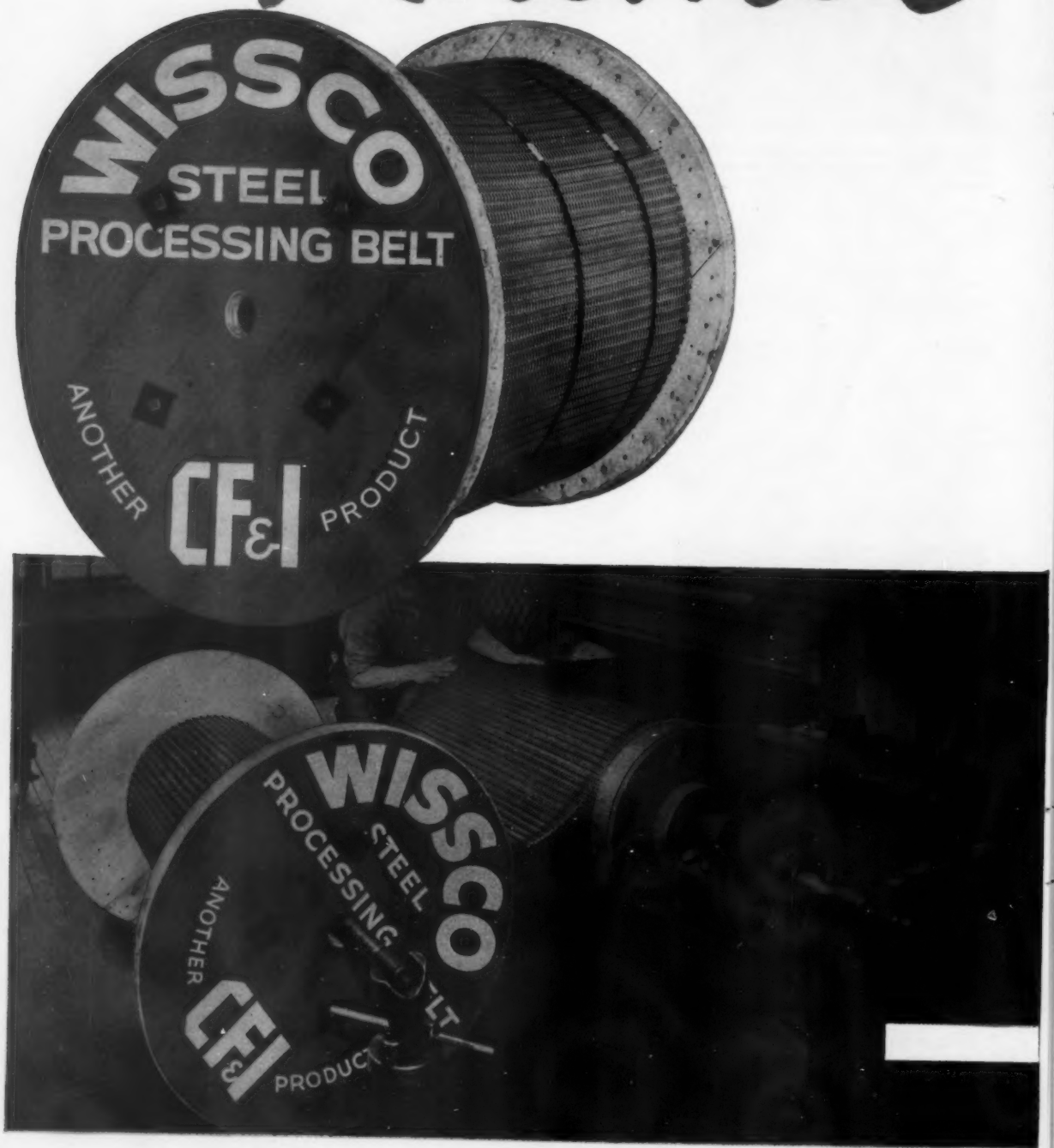
Another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First!

WISSCO STEEL PROCESSING BELTS

NOW AVAILABLE ON REELS!

Ever since it made the first metal processing belt, Wickwire has contributed many important *firsts* to the industry. It was Wickwire who was...

... first with the balanced spiral construction
... first with the rod reinforced belt
... first with the flat thin spiral
... first with the rod reinforced "quick splice" connector

... AND NOW IT'S FIRST TO SHIP BELTS ON REELS

It's now a lot easier and quicker to install that new conveyor, lehr or furnace belt—if it's a Wissco Belt on the new, convenient, money-saving reel*.

Because of this important advancement, you can feed the belt directly onto the conveyor, lehr, furnace or other piece of equipment where it'll be used. There's less danger of damage during installation. And, there's no more piecing a belt together which arrived in as many as 20 different crates . . . no more installing sections "wrong-end-to" or upside down.

What's more, these Wissco Belts on the new reels save you big money. They cost less to install. You get your equipment back into operation faster. You don't have to pay freight, handling and storage charges on up to 20 large, heavy crates. And there's *no charge for the reel*—it's yours to do with as you please.

Contact your Wickwire representative today. He'll give you the complete story on the many ways that Wickwire Processing Belts can save you money in your operation.

*Belts over 100′ long or requiring two or more shipping crates are now being shipped on a single reel unless they are over 54″ wide or weigh over 2000 lbs. (these can be shipped under special arrangements).

WISSCO BELTS

PRODUCTS OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

CF&I

THE COLORADO FUEL AND IRON CORPORATION—Denver and Oakland

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No
PLUNGER ELECTRIC
installation
is too
large

NEW BOOKLET

Booklet A-414 describes the NEW Otis Plunger Electric Freight Elevator designed for low-rise, light and heavy duty freight handling requirements. We'll be glad to send this booklet to you.

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ELECTRIC • PLUNGER ELECTRIC

freight elevators

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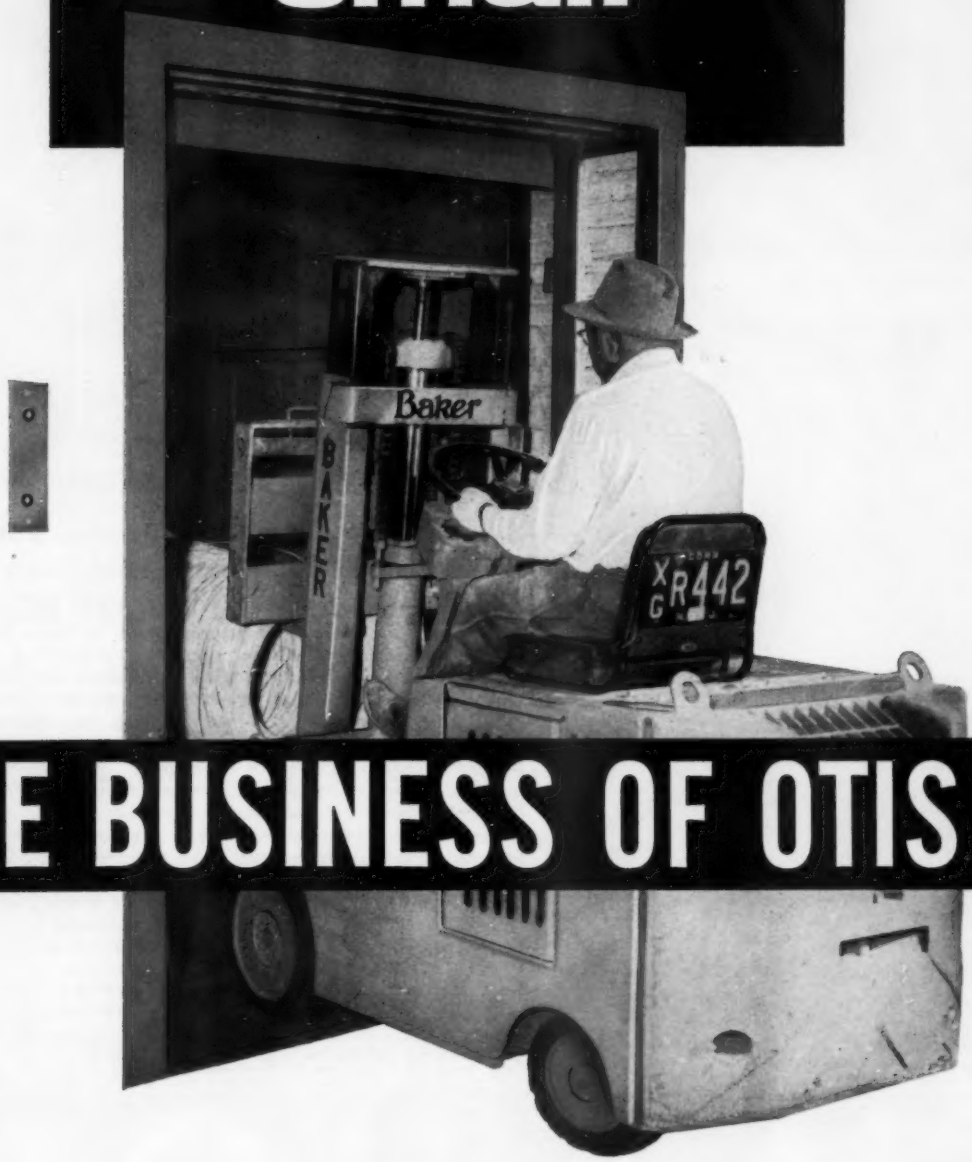
installation
is too
small



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OFFICES IN 294 CITIES ACROSS THE UNITED STATES AND CANADA

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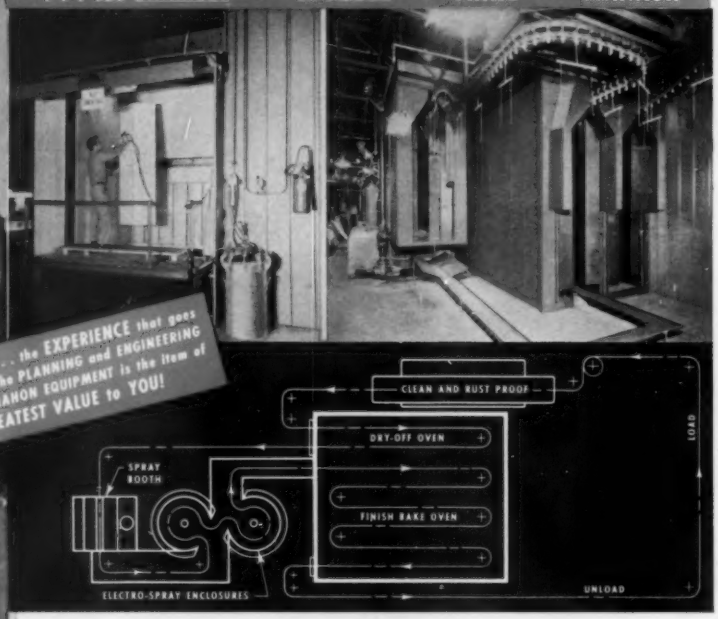
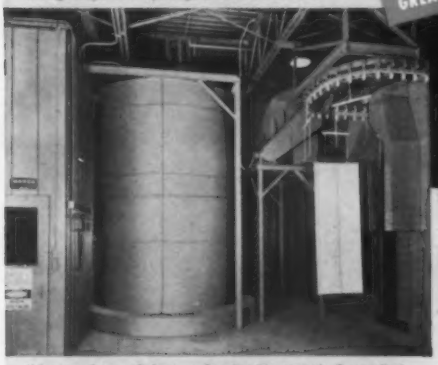
COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH

Ventilated, Circular Electrostatic Spray Enclosure. Disc Applicator travels up and down. Air is exhausted through adjustable openings around the bottom.



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!



Exterior of one of the two Circular Electrostatic Spray Enclosures. Air Exhaust Duct is continuous around the bottom.

Exit end of Finish Baking Oven. In this installation the Dry-Off Oven and Finish Baking Oven are combined in one unit.

Compact MAHON SYSTEM Finishes 2000 "SLIMFOLD" Metal Closet Doors Per Day!

The finishing equipment shown here is a Complete Mahon Finishing System designed especially to do a particular job for Ternes Steel Company, Detroit. It includes facilities for cleaning, rust proofing, drying, spray painting, electrostatic coating and finish baking on both sliding and folding metal closet doors. This is a typical example of Mahon's service to industry. No matter what your finishing requirement may be, it will pay you to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you will find them better qualified to advise you, and better qualified to do the all-important planning, engineering and coordinating of equipment, which is the key to fine finishes at minimum cost. And, if you care to investigate, you will find that Mahon equipment will serve you better . . . because Mahon equipment is engineered better and built better for more economical operation over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File for further information, or write for Catalog A-656. Better still, why not have a Mahon engineer call at your convenience.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

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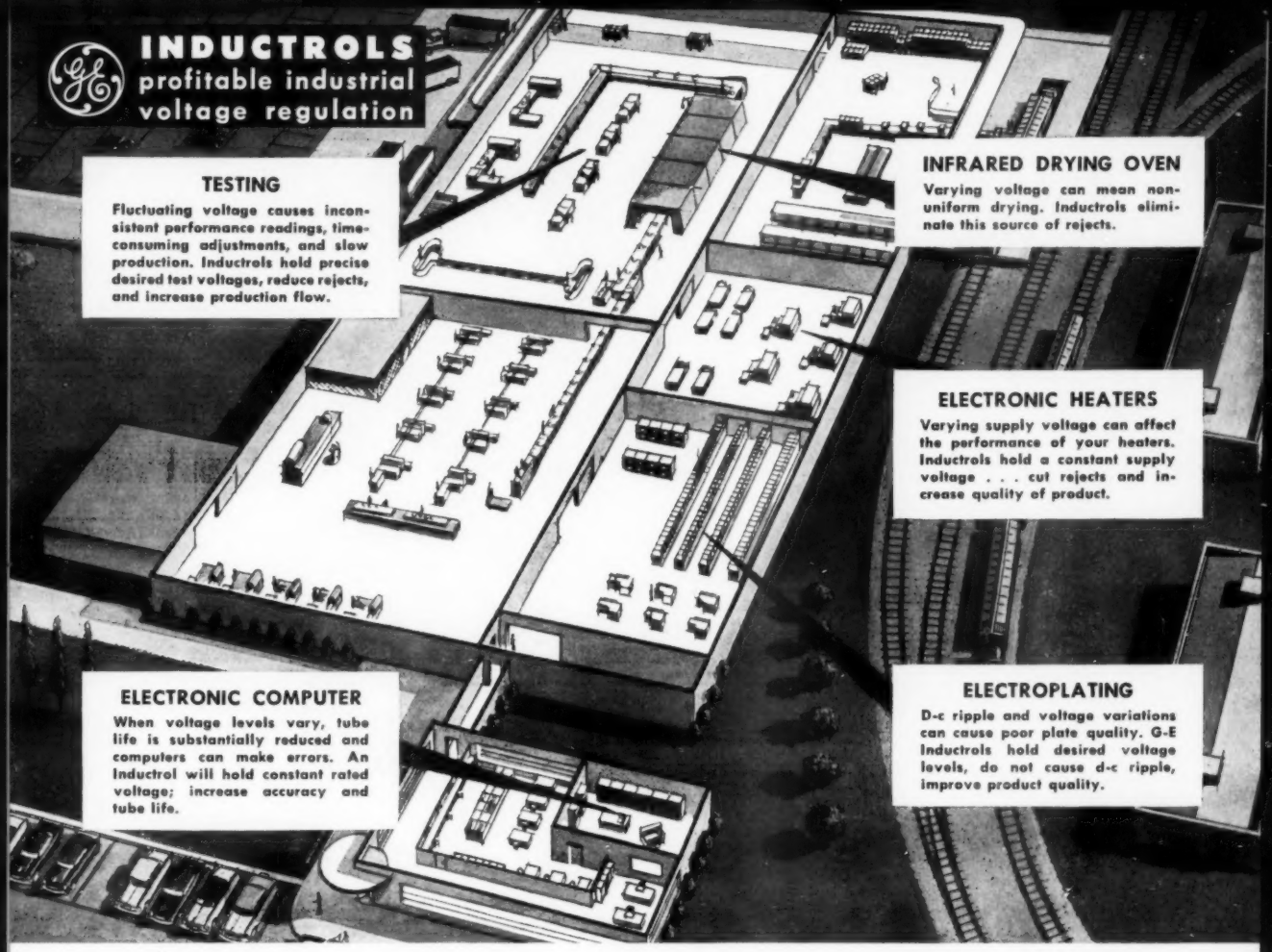
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voltage regulation
TESTING
Fluctuating voltage causes inconsistent performance readings, time-consuming adjustments, and slow production. Inductrols hold precise desired test voltages, reduce rejects, and increase production flow.
INFRARED DRYING OVEN
Varying voltage can mean non-uniform drying. Inductrols eliminate this source of rejects.
ELECTRONIC HEATERS
Varying supply voltage can affect the performance of your heaters. Inductrols hold a constant supply voltage . . . cut rejects and increase quality of product.
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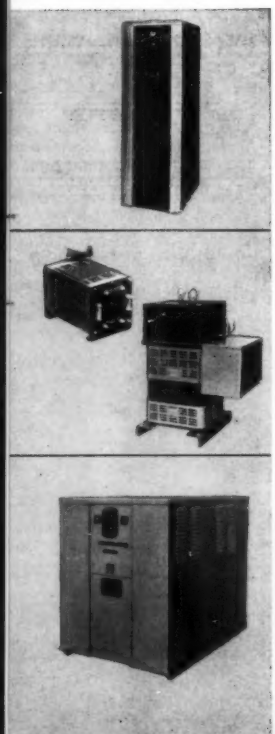
When voltage levels vary, tube life is substantially reduced and computers can make errors. An Inductrol will hold constant rated voltage; increase accuracy and tube life.
ELECTROPLATING
D-c ripple and voltage variations can cause poor plate quality. G-E Inductrols hold desired voltage levels, do not cause d-c ripple, improve product quality.

Cut production costs, improve product quality, with General Electric Inductrols



A G-E INDUCTROL FOR EVERY NEED

AUTOMATIC INDUCTROL

Automatically maintains voltage within ±1% band width on single- and three-phase circuits, 600 volts and below.

MOTOR- OR HAND-OPERATED INDUCTROL

Provides stepless variable-voltage output over any desired range. For process control, testing, heating, and similar applications. Single- and three-phase, 600 volts and below.

INDUCTROL POWER PACK

Actually an a-c load-center unit substation; includes a transformer, Inductrol, and distribution panel board with circuit breakers. Generally for three-phase circuits, 600 volts and below, indoor service.

Example shows how in-plant voltage regulation can save money, boost production, improve product, increase equipment life.

Any electrical equipment operates best at nameplate voltage. Even small deviations from rated voltage can reduce efficiency and shorten the life of your equipment.

G-E Inductrols (induction voltage regulators) offer an economical, profitable solution to your voltage problems. Inductrols have long, virtually maintenance-free life. There are no brushes to wear out or give trouble. High short-circuit strength assures reliable operation. The composite example above illustrates just a few ways you can save through the use of General Electric Inductrols.

For complete information and application assistance, contact your nearest General Electric Apparatus Sales Office, or write Section 425-1, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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GENERAL ELECTRIC ANNOUNCES...
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GENERAL ELECTRIC
DIRECT CURRENT MOTOR

Direct-current Motor

KINAMATIC* a new standard in direct-current motors, gives your machines wider speed ranges, greater output

To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

Accelerated Production—The new d-c Kinamatic motor will modernize your equipment, give it increased power, higher speeds, greater output capacity. With the quick-acting G-E Kinamatic motor, your machines will process a greater variety of products . . . faster . . . easier . . . and with less maintenance and spoilage.

More Powerful—By combining advanced design with improved materials and manufacturing techniques, General Electric engineers have packed more power into the entire Kinamatic line. The powerful Kinamatic motor, with new stamina and durability, is ready to become one of your most effective weapons for keeping costs down, for meeting competition, for boosting productivity levels.

Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-1

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GENERAL ELECTRIC

Imagine... a quarter acre of controlled daylighting without one maintenance headache

Think of it . . . two giant wall areas, totaling a quarter acre, that bring controlled daylight in, keep maintenance out.

This is the story at Philadelphia Electric Company's 350,000 kw Cromby Station, Cromby, Pa. It's a story that really started about 13 years ago, when Company designers first used glass blocks for major wall areas in one of their power generating plants. Over the years, they discovered two important facts about these glass block installations: (1) they provided controlled, glare-free daylighting; (2) they completely eliminated sash repair and replacement, painting, window washing, and breakage.

These favorable experiences were well remembered when the Company's Cromby Station was planned. More than 11,000 PC Glass Blocks were installed in the north and south walls. The installation, based on past performance, is anticipated to match the life of the plant itself.

If you are planning new construction, or window modernization, you'll find it profitable to investigate the many advantages of PC Glass Blocks. For more information, see us in Sweet's, or write Pittsburgh Corning Corporation, Dept. PG-66, One Gateway Center, Pittsburgh 22, Pa. In Canada, 57 Bloor Street West, Toronto, Ontario.

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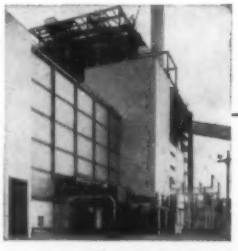

PC Glass Blocks

PITTSBURGH PC CORNING ®

Also manufacturers of FOAMGLAS® insulation

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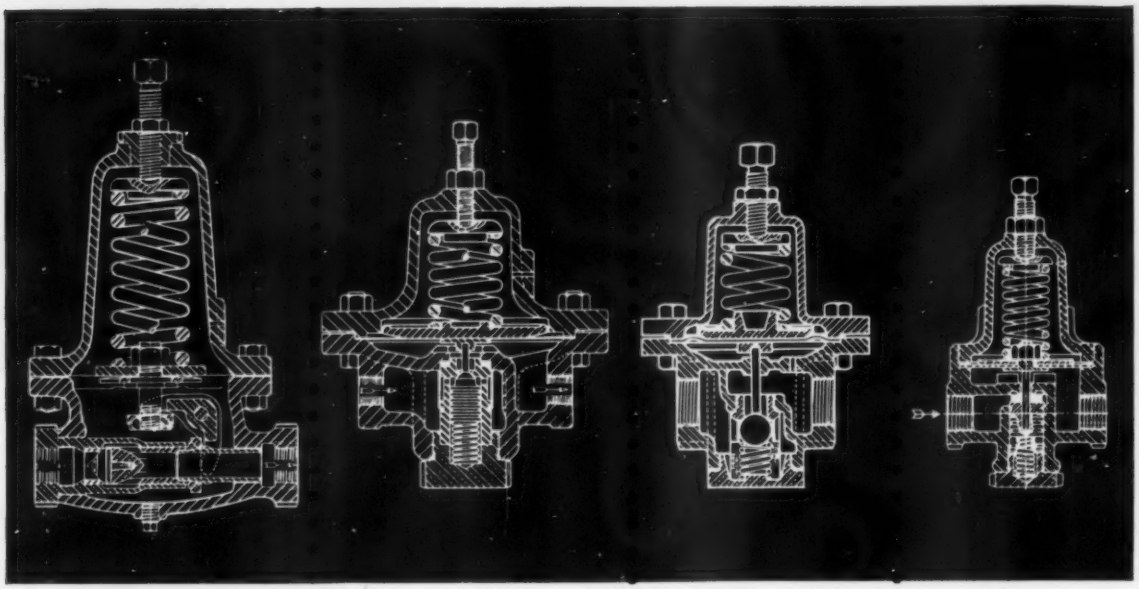
What's your pressure problem?

CASH STANDARD

has the answer...*or will find one!*



HERE ARE FOUR TYPES FOR MANY APPLICATIONS

TYPE 1000 — A streamlined, high capacity valve for close pressure regulation—accurate even under toughest working conditions. Closes against the flow, eliminating conditions that cause chatter. Sizes: ¼" to 2", screwed ends. Bulletin 962.

TYPE D — A general purpose regulator with exceptional regulation characteristics. Now improved to permit easier servicing but basically the same dependable valve offered for over 35 years. Sizes: ¼" to 2". Bulletin 950.

TYPE 1260 — A high capacity pressure regulator, small and well proportioned. Available with spherical, self-cleaning inner valve. Suitable for air, water, steam, oil and most fluids and gases. Sizes: ½", ¾", 1", screwed ends. Bulletin S-700.

TYPE 3381 — A small, compact, all-bronze pressure regulator, very accurate and dependable. Available with pressure gauge mounted in one of the two outlet connections. For small lines. Sizes: ¼" and ⅜", screwed ends. Bulletin 948.

There's a Cash Standard regulator for every pressure control problem!

For an individual solution to your control problem, contact the Cash Standard control specialist in your area, or write Dept. D.

CASH C S **STANDARD**

A. W. CASH COMPANY, P. O. Box 551, Decatur, Illinois

Pressure, Hydraulic, Temperature, Process and Combustion Controls

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Please send me the Platecoil story.

My problem is _____

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TRANTER PLATECOILS® GIVE YOU

SIZZLE INSTEAD OF FIZZLE

IN PROCESS HEATING APPLICATIONS

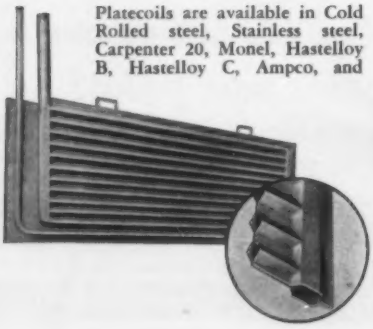
You get heat transfer when you need it and where you need it when you use Tranter Platecoils. Actual experience has proved Platecoils give faster, more efficient heat transfer than old-fashioned pipe coils. The continuous, rigid, and relatively flat surfaces of Platecoil units provide greater prime heat transfer surface in a smaller space than do pipe coils. Being smaller and compact, Platecoils can be positioned in a tank or vat to give the heating or cooling where it is needed. Speed heat up time, reduce downtime, increase tank capacity and shorten operating cycles — use Tranter Platecoils to make production sizzle instead of fizzle.

THESE ADVANTAGES CUT COSTS

Platecoils are installed on easy, quick-change hangers. Platecoils can be installed or replaced in minutes without a hoist or other machinery. Made in standard sizes to give standardized, dependable performance, Platecoils save on engineering and fabricating time. Because of greater heating efficiency Platecoils make savings on initial cost that range up to the spectacular in special alloys.

NOW AVAILABLE IN THESE METALS

Platecoils are available in Cold Rolled steel, Stainless steel, Carpenter 20, Monel, Hastelloy B, Hastelloy C, Ampco, and Nickel. Orders for Cold Rolled steel and Stainless steel get fast delivery from factory-tested stock.



PLATECOIL®

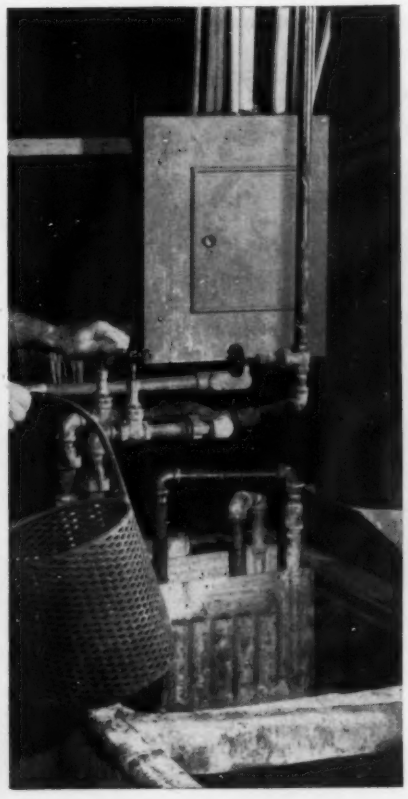
DIVISION

TRANTER MANUFACTURING, inc.

780 E. Hazel St., Lansing 4, Michigan

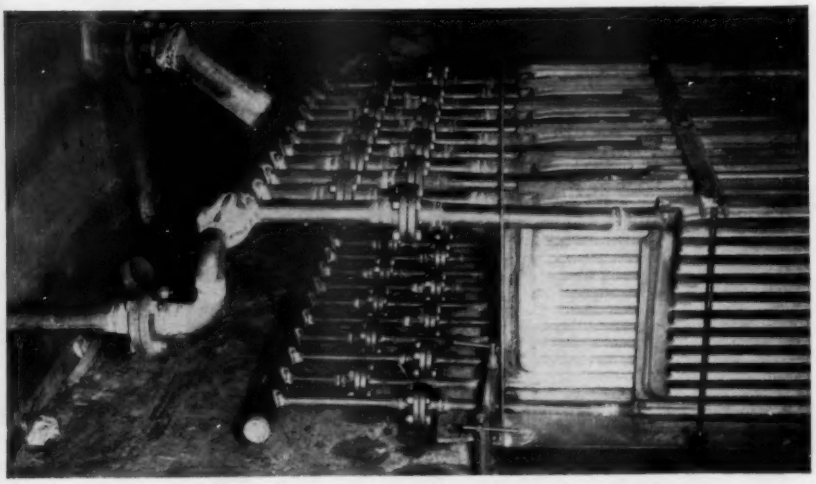
INCREASED PRODUCTION 25%

Two Platecoil units, 22" wide and 83" long, hung on either side of this aluminum anodizing tank at Jack & Heintz, Inc., have increased production in this department by 25%. Made of type 316 Stainless Steel to resist corrosion from the anodizing solution, they keep the solution at the desired 70°F temperature without the downtime between batches needed by the former cooling method that required pumping the anodizing solution to a separate cooling tank and back.



SAVED SPACE, INSTALLATION AND MAINTENANCE COSTS

Dexter Industries, Inc. uses Platecoils to heat plating solutions, cleaners, pickling, etching and oxidizing (shown at left) solutions. They report heat up time has dropped substantially and maintenance and downtime due to pipe coil failure has been slashed to bring big savings. Dexter also specifies Platecoils in original equipment.



STEAM COSTS REDUCED 96%

A bank of 11 Platecoils in the bottom of a 250,000-gallon tar storage tank is used by Old Colony Tar Co. to replace a coil of 750 feet of 2-inch pipe to heat tar for removal to a tank car or truck. With pipe coil, it was necessary to heat the entire contents of the tank for each draw-off which cost $100 each time. With Platecoils it is only necessary to heat the tar being removed which costs only $4.00 per removal.

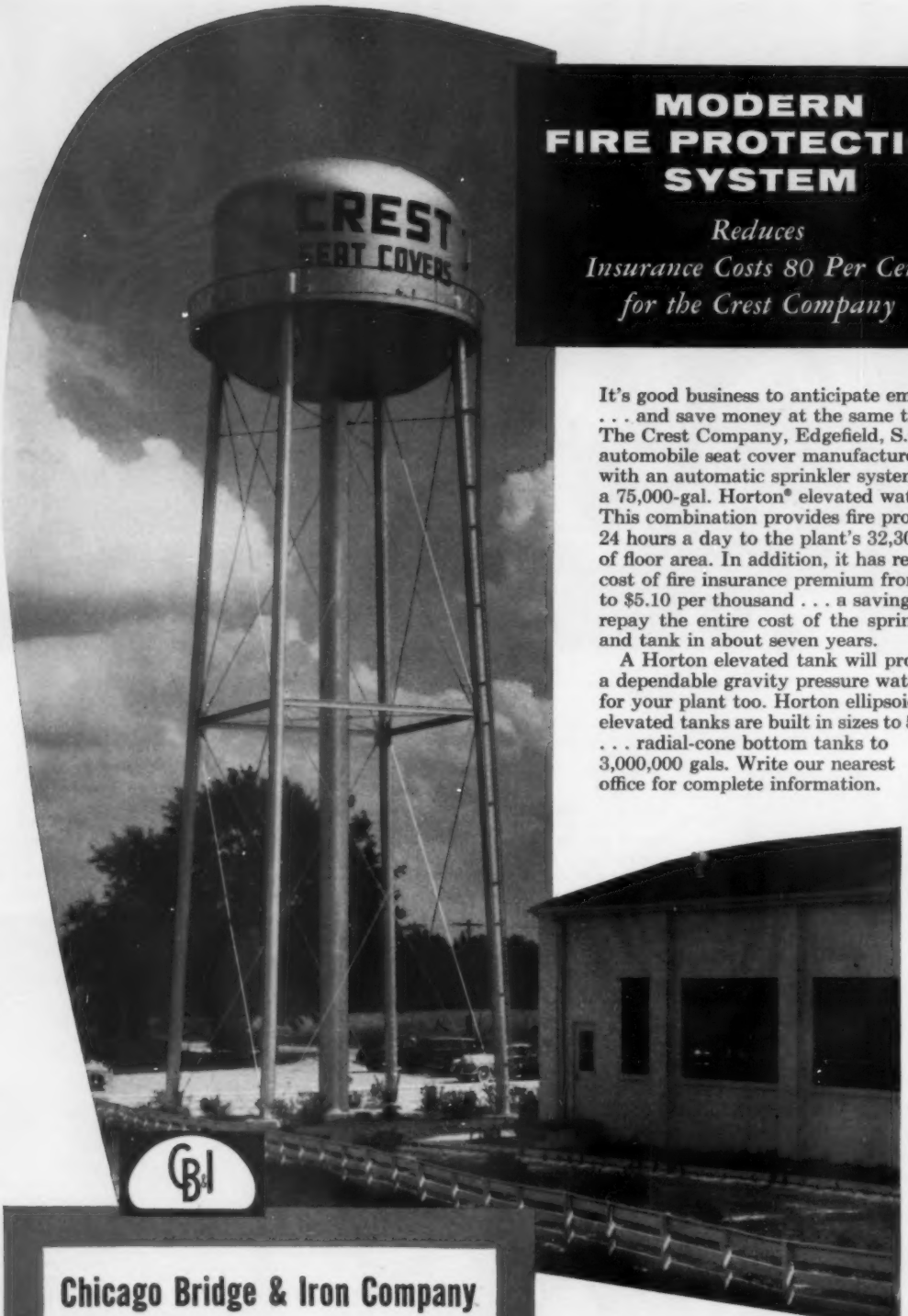
For more facts circle 555 on Reply Card

MODERN FIRE PROTECTION SYSTEM

Reduces Insurance Costs 80 Per Cent for the Crest Company

It's good business to anticipate emergencies . . . and save money at the same time. The Crest Company, Edgefield, S.C., automobile seat cover manufacturers, did it with an automatic sprinkler system and a 75,000-gal. Horton® elevated water tank. This combination provides fire protection 24 hours a day to the plant's 32,300 sq. ft. of floor area. In addition, it has reduced the cost of fire insurance premium from $25.50 to $5.10 per thousand . . . a savings that will repay the entire cost of the sprinkler system and tank in about seven years.

A Horton elevated tank will provide a dependable gravity pressure water supply for your plant too. Horton ellipsoidal-bottom elevated tanks are built in sizes to 500,000 gals. . . . radial-cone bottom tanks to 3,000,000 gals. Write our nearest office for complete information.



The 75,000-gal. Horton ellipsoidal-bottom elevated water tank shown above provides a primary water supply for the automatic sprinkler system at the Crest Company, Edgefield, S. C.

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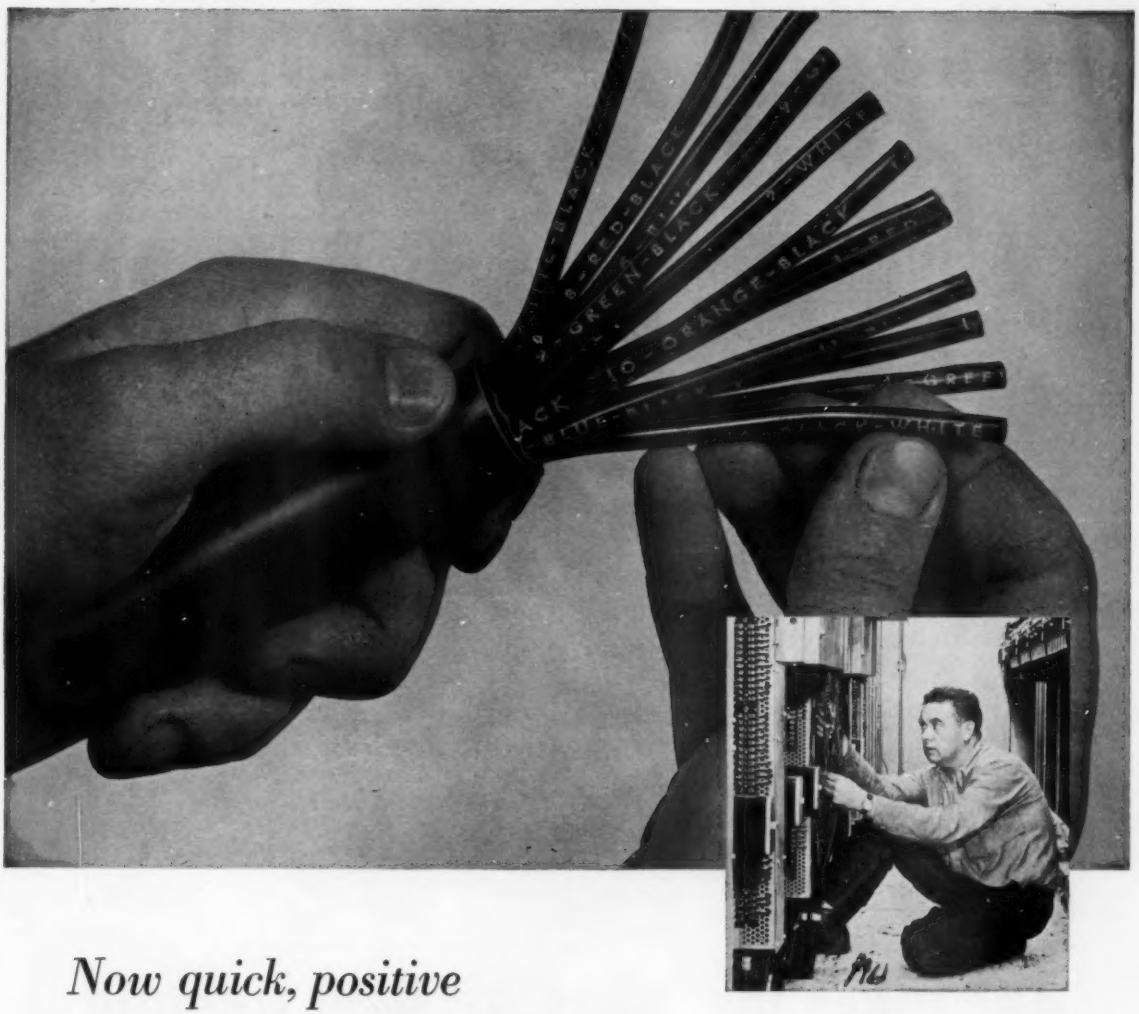

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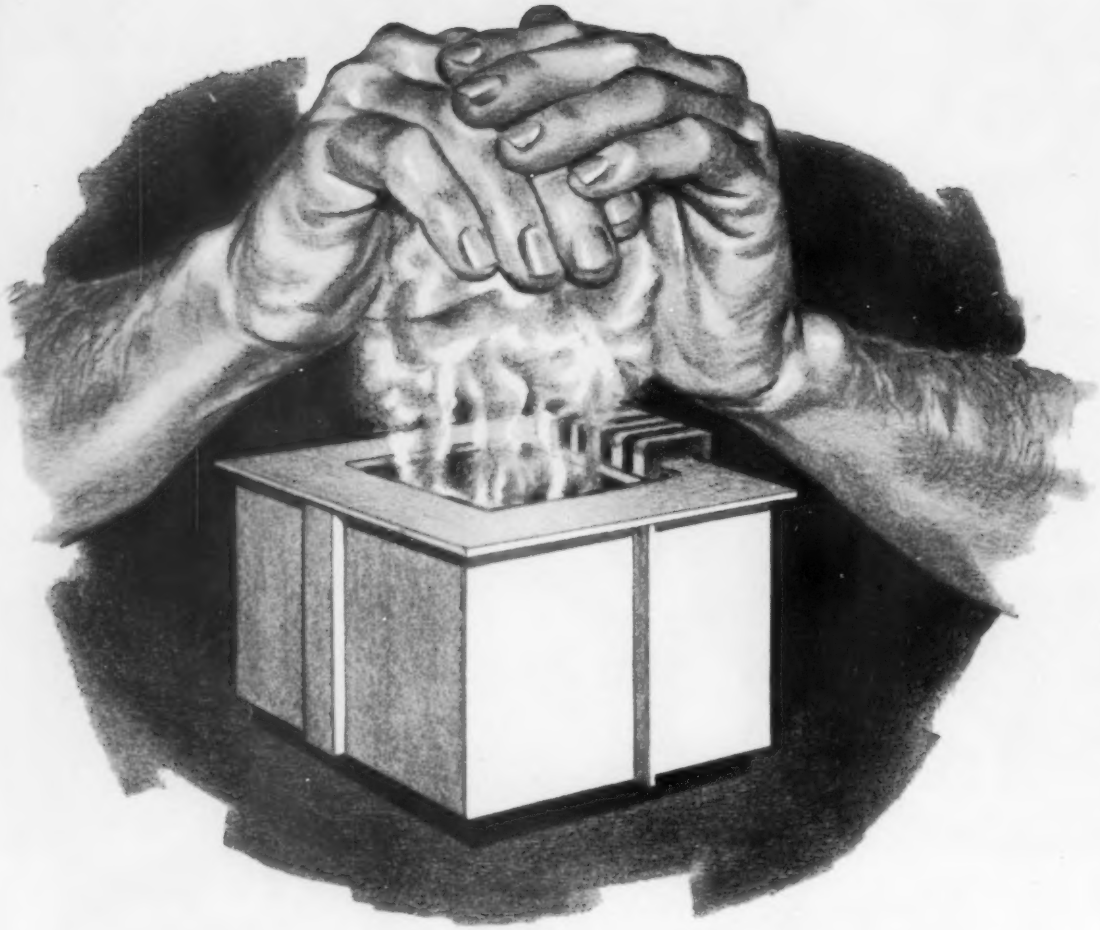

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CONSTRUCTION BRIEFS — a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

CONNECTIONS

DESIGN OF FASTENINGS for structural elements in timber and steel construction is a vital aspect of the entire structural design picture. In many situations the design of the connections precedes the design of the structural elements and in all cases a knowledge of the connection is desired prior to the design of the structural parts. Connections in steel and other metallic structures are accomplished by rivets, bolts and welds. Connections in timber are made with nails, spikes, screws, bolts and timber connectors.

The first types of connections to be discussed will be rivets and bolts for steel constructions. The designs of rivets and bolts are treated identically. All values for turned bolts in reamed or drilled holes are identical to those for the same sizes of rivets, whereas the values for unfinished bolts are about ⅔ of the value for rivets. In the discussion to follow, only the rivet will be mentioned, however the application to bolts is implied.

Figure 1a shows a simple riveted lap connection. When the load P is increased beyond the capacity of the connection, it will fail in one or more of several ways, as shown in Fig. 1. Designing the connection, one should provide for the weakest failure mode.

Should the structural elements be in tension, sufficient area of material in the plate outside the rivet hole should be provided to prevent failure in tension as shown in Fig. 1b.

Failures in the plate in shear (Fig. 1d) or splitting (Fig. 1e) may be safely resisted by providing sufficient edge distance. Minimum edge distances will depend on whether it is a sheared edge, rolled edge in a plate, or rolled edge of a structural shape. Such minimum edge distances can be found in the A.I.S.C. specifications.

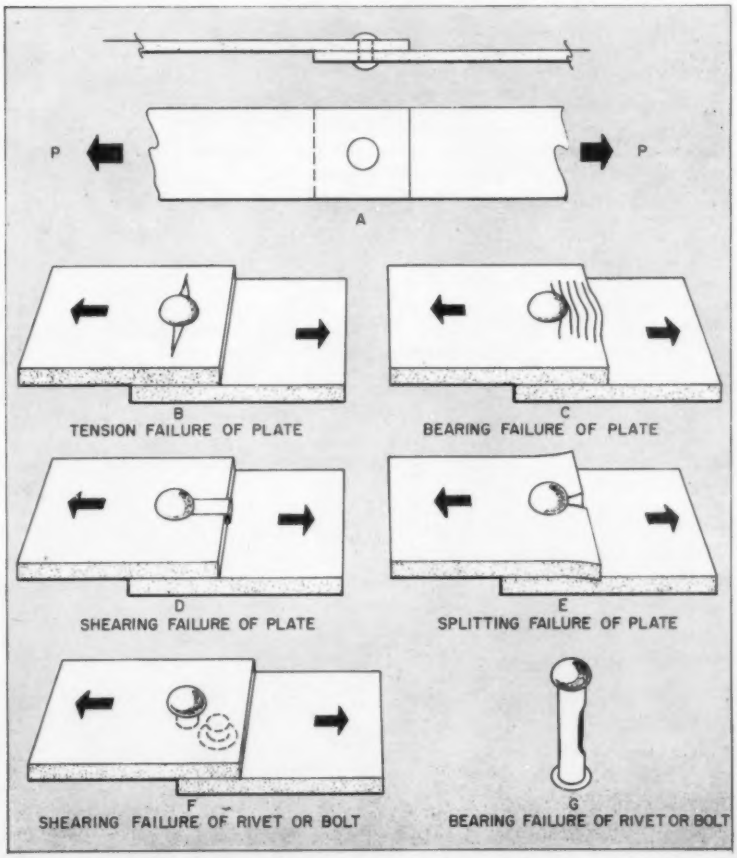

Fig. 1. Simple riveted lap joint, and illustrations of modes of joint failure

If the plate is designed to withstand the tension stresses and edge distance is at the prescribed minimum or larger, then the design of the rivets will depend on the shearing resistance of the rivet (Fig. 1f) and the bearing resistance of the plate and rivet (Fig. 1c and 1g).

If the allowable shearing stress in a rivet is f_s, the the capacity of a rivet in shear is:

$$R_s = f_s A_R$$

where A_R is the cross-sectional area of the rivet.

Since the bearing area against the plate or against the rivet is equal to the projected width of the rivet times the thickness of the plate, then

$$R_B = f_b t d$$

where R_B is the capacity of the rivet or plate in bearing, f_b is the allowable bearing stress, t is the thickness of the plate, (for two plates of different thickness it is the smallest thickness), and d is the rivet diameter.

Of course the values R_s and R_B may not be the same, and the smaller of the two is the capacity of the rivet. This smaller value is known as the rivet value.

Basically, plates or structural shapes may be connected with rivets in one of two ways: lap connection and butt connection.

It should be noted in the lap connection that the resistance to shear is along a single plane whereas in the butt connection it is along two planes. We therefore refer to the lap connection, as shown in Fig. 1, as single shear and the butt connection, as double shear. Then:

$$R_{ss} = f_s A_R; \quad R_{ds} = 2 f_s A_R$$

where R_{ss} is the rivet value for single shear and R_{ds} is the rivet value for double shear.

When a connection in single shear is subjected to loads the forces tend to become co-linear due to plate bending action. This creates an unequal distribution of the bearing stresses affecting the rivet. The equation for rivet value in bearing contains the term f_b which is the average bearing stress. Therefore, the value of the allowable f_b in bearing will be smaller for single shear connections than it will be for double shear connections. Thus,

$$R_B = f_{bss}\, td \text{ and } R_B = f_{bds}\, td$$

where f_{bss} is the allowable bearing stress in single shear and f_{bds} is the allowable bearing stress in double shear. For double shear the value of t should be the thickness of the inside

plate or the sum of the two outside plate thicknesses, whichever is smaller.

The A.I.S.C. specifications allow the following stresses:

Shearing

Rivets and turned bolts in reamed or drilled holes 15,000 psi
Unfinished bolts 10,000 psi

Bearing

Rivets and turned bolts in reamed or drilled holes { 40,000 psi / 32,000 psi }
(Higher value, double shear)

As an example, the rivet value for a ⅞-in. rivet in double shear with a ⅜-in. inside plate and two ¼-in. outside plates can be found by solving:

$$R_{ss} = 2\, f_s\, A_s =$$
$$2 \times 15{,}000 \times .6013 = 18{,}040 \text{ psi}$$
$$R_b = f_{bs}\, td =$$
$$40{,}000 \times \tfrac{3}{8} \times \tfrac{7}{8} = 13{,}125 \text{ psi}$$

The value in bearing governs and thus the rivet value for this situation is equal to 13,125 psi.

Similar values for all sizes of rivets and bolts and thicknesses of plates may be found in the A.I.S.C. Manual.

In order to proceed with the design of a practical problem in connections, a few words of review are necessary in the design of tension members.

In the case of compression members the allowable stress is dependent upon the l/r ratio of the member. In the case of the tension member the allowable stress or tension remains constant. This value for steel, in accordance with the A.I.S.C. specifications, is 20,000 psi. In the column, A is the

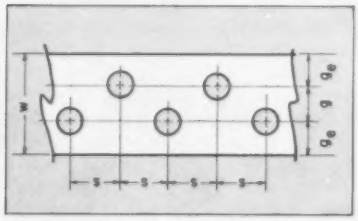

Fig. 2. Rivet holes drilled in staggered pattern. Formula in text applies

gross area of the member, whereas in the tension member, A must be the net area of the member at the point of minimum net area. Therefore, in a tension member it is necessary to determine the minimum net area. Where a tension member is connected with rivets it is necessary to exclude the rivet holes in determining the area of the cross section. For the purpose of determining the area taken by a rivet it is assumed that the rivet hole is ⅛ in. larger than the rivet—thus the net area of a plate 6 in. by ½ in. with one ⅞ in. rivet is:

$$A = 6 \times \tfrac{1}{2} -$$
$$(\tfrac{7}{8} + \tfrac{1}{8})\ \tfrac{1}{2} = 2.5 \text{ sq in.}$$

A difficulty arises in the determination of net area when rivets are staggered as shown in Fig. 2. In this situation the net area is determined by deducting the area of two holes from the gross area and then adding the term $\frac{s^2}{4g}$ t, unless this is greater than the area determined by deducting the area of just one hole. It is often necessary to stagger the rivets where the gage 'g' is too small to allow two rivets in one line. The minimum spacing of rivets is 3 rivet diameters.

Illustrative Problem

Figure 3a shows the forces in a bottom chord joint of a truss. These forces are determined as illustrated in the Briefs on trusses.

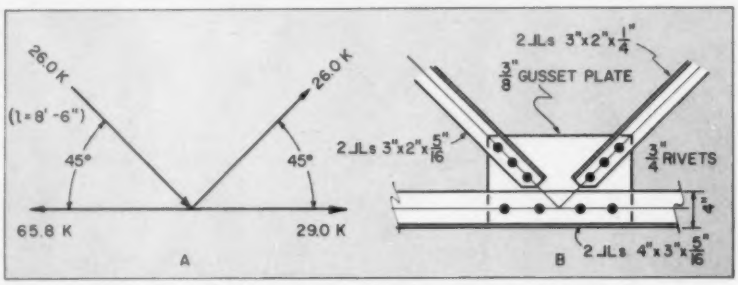

Fig. 3. Typical joint in bottom chord of truss. Design solution is shown below

Design of Compression Diagonal

Assuming f = 10,000 psi, A(reqd) $= \frac{26{,}000}{10{,}000} = 2.60$ sq in.

Try 2 angles, 3 × 2 × 5/16, long legs back to back

From the tables, A = 2.94 sq in., least r = 0.90, $l/r = \frac{8.5 \times 12}{.90} = 113$, and f = 10,810 psi

Therefore, A (req'd) = 2.40 sq in.

For comparison, try the next smaller set of angles, 3 × 2 × ¼

From the tables, A = 2.38 sq in., least r = 0.89, $l/r = \frac{8.5 \times 12}{.89} = 115$, and f = 10,590 psi

Therefore, A (req'd) = 2.46 sq in.

Since the actual area of the smaller set of angles does not equal the required area, the 3 × 2 × 5/16 angles should be used.

Design of Tension Diagonal

A (req'd) $= \frac{26{,}000}{20{,}000} = 1.30$ sq in.

Try 2 angles, 3x2 × ¼, one hole out of each angle.

A (net) = 2.38 — 2 × ¼ × (¾ plus ⅛) = 1.94 sq in.

Use 2 angles, 3 × 2 × ¼, since ¼ in. is minimum recommended thickness and 3 in. leg is minimum recommended width for ¾-in. rivets.

Design of Tension Bottom Chord

A (req'd) $= \frac{65{,}800}{20{,}000} = 3.19$ sq in.

Try 2 angles, 4 × 3 × 5/16, long legs back to back, one hole out of each angle

A (net) = 4.18 — 2 × 5/16 × (¾ plus ⅛) = 3.63 sq in.

Try 2 angles, 4 × 3 × ¼

A (net) = 3.38 — 2 × ¼ (¾ plus ⅛) = 2.94 sq in.

The net area is insufficient for the loading.

Therefore, use 2 angles, 4 × 3 × 5/16

Design of Rivets

Rivet Value for ¾ in. rivet, ⅜ in. gusset plate, double shear
R = 11,300 psi

Number of rivets required in bottom chord $= \frac{26{,}000}{11{,}300} = 2.30$

Therefore, use 3

Number of rivets required in bottom chord $= \frac{65{,}800\text{-}29{,}000}{11{,}300} = 3.26$

Therefore, use 4

Figure 3b shows a complete design. Rivets in diagonal to be spaced at minimum spacing of 3 rivet diameters or 2¼ in. The rivets in the bottom chord are to be equally spaced to provide a rectangular gusset plate.

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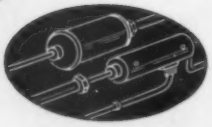

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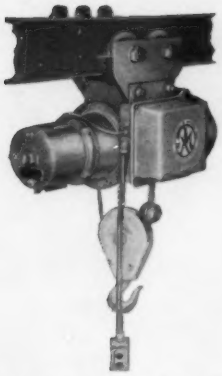

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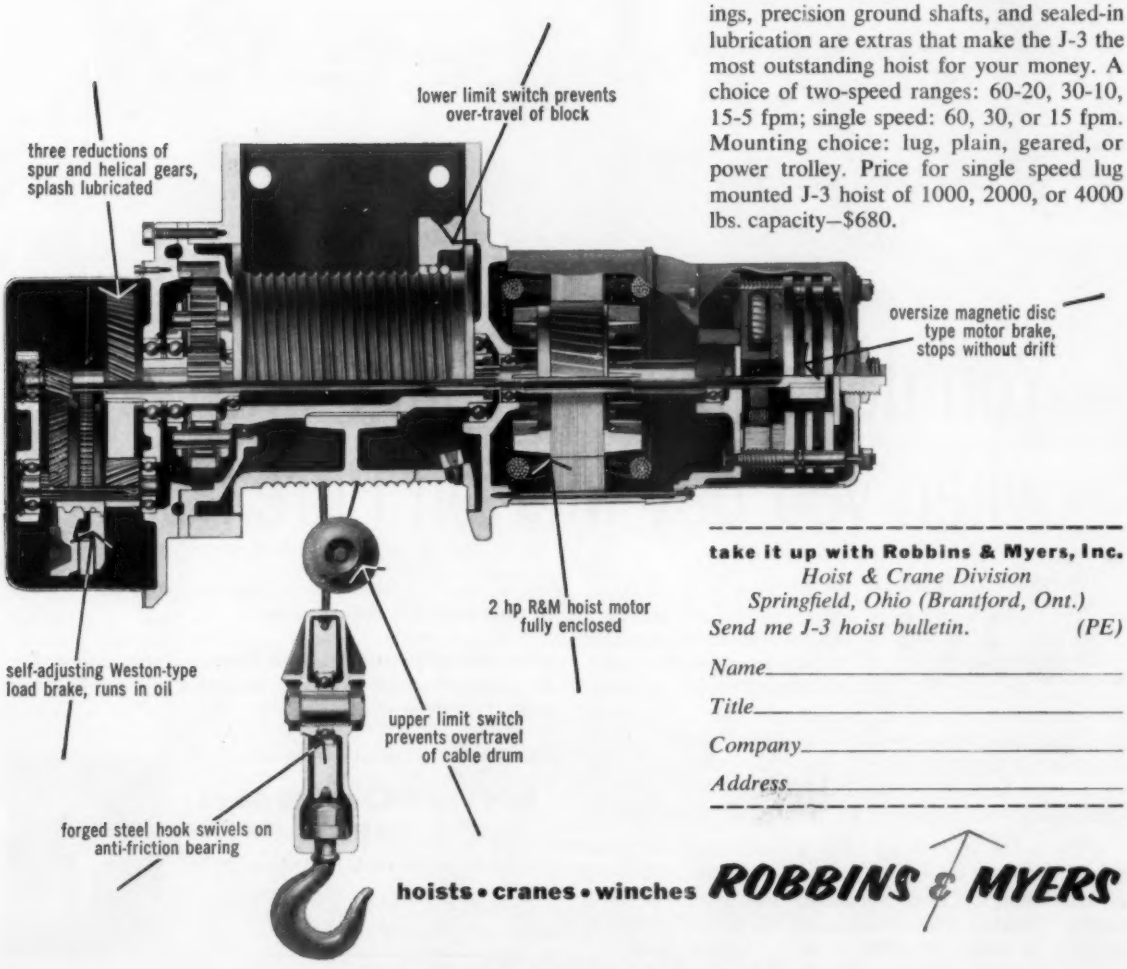
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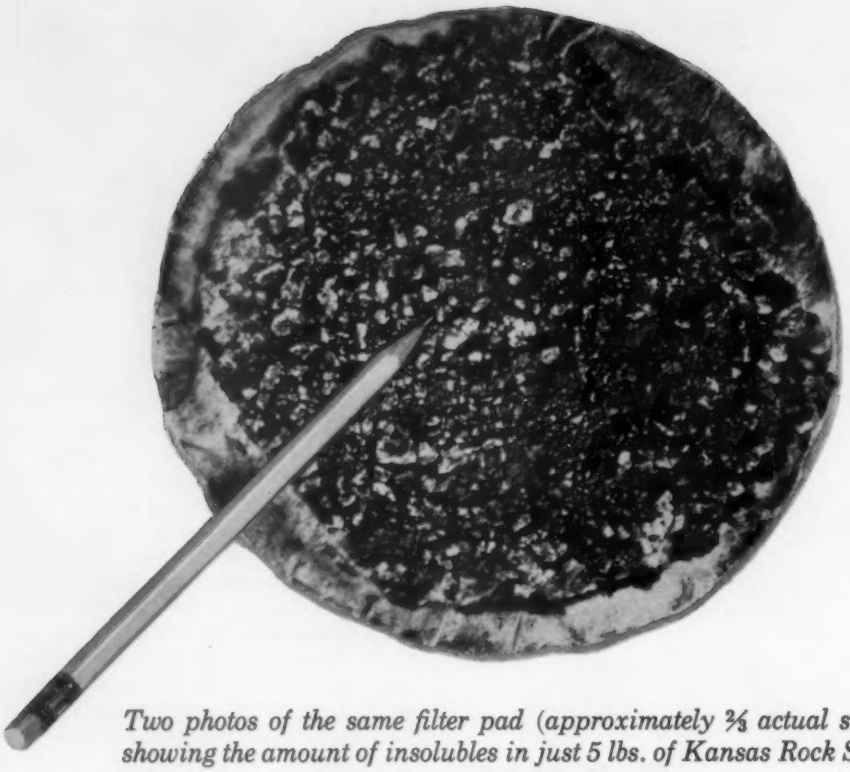

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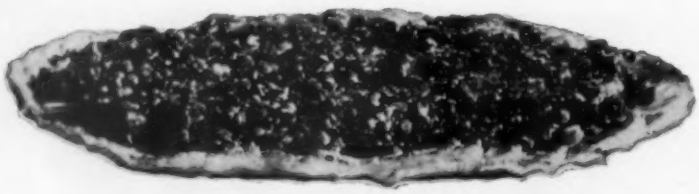

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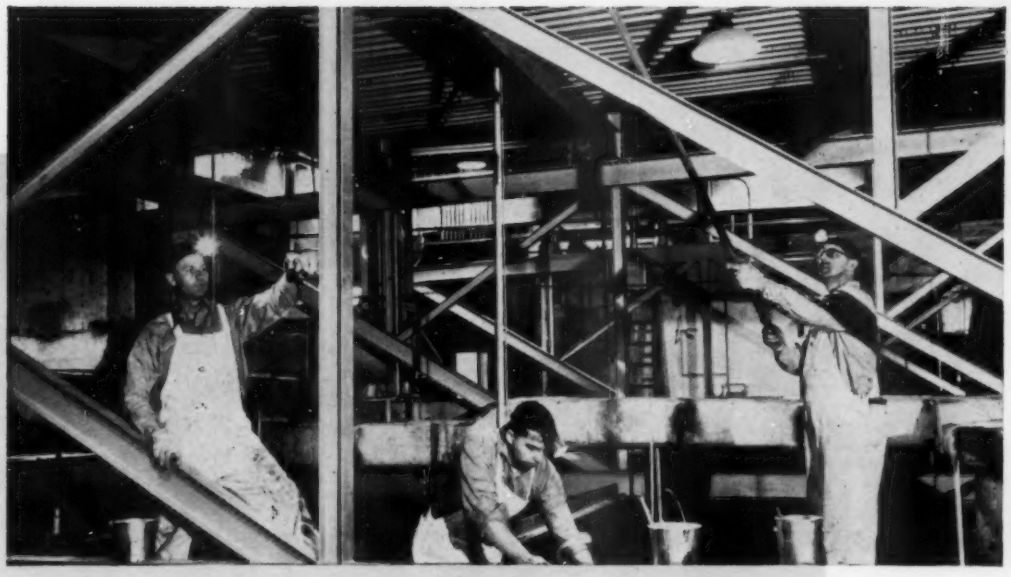

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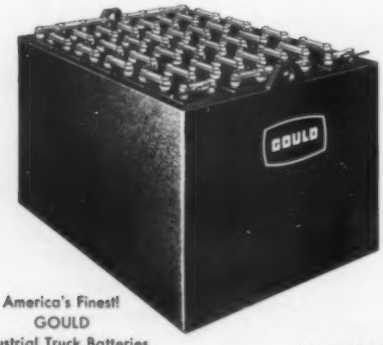

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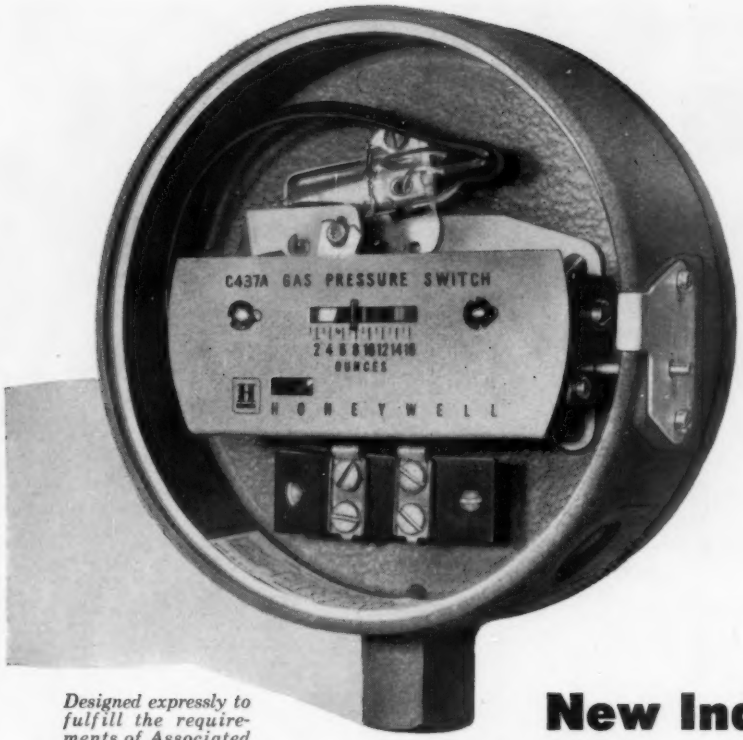

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1. Sealed Pressure Chamber—Should the diaphragm rupture from over pressure or any other cause, gas can't escape into the switch compartment or to the atmosphere. The pressure chamber is fitted with a pipe tap to permit venting to the stack.

2. Protected Settings—All adjustments are inside the case for protection against careless or accidental manipulation. A metal plate on the side of the case must be removed before changes in adjustment can be made.

3. Ever-Visible Switch Position and Control Settings—The entire cover of the pressure switch is a window. Position of the mercury switch and adjustment of the control settings can be determined at a glance.

4. Lockout Mechanism—An optional safety feature, when manual resetting is desired. The lockout mechanism prevents the switch from remaking contact after pressure has once dropped below the setpoint . . . even though pressure returns to normal. The lockout release button is the only adjustment that can be manipulated without removal of the protecting metal plate.

For complete information, call the nearest Honeywell office. A Honeywell sales engineer is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA:**

Send for Specification S1011-1 Honeywell Gas Pressure Switch C437A

MINNEAPOLIS **Honeywell**
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First in Controls

For more facts circle 565 on Reply Card

It's not just static strength...

RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined side bars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.

STRENGTH OF CHAIN IN MOTION is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of sidebars, prelubrication and rigid quality control from initial selection of materials to final protective boxing.

it's *dynamic strength*

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ON high-speed drives or heavy conveying jobs, the components of every pitch of roller chain face severe and repeated operating stresses—engagement with sprockets, shock of starting loads, centrifugal loads and others. That's why *dynamic strength*—ability of chain to resist these stresses—is so important. And it's built into *every length* of Link-Belt Precision Steel Roller Chain.

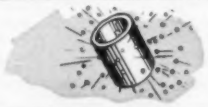
How is dynamic strength developed? In addition to Link-Belt "extras" . . . special design, manufacturing and processing steps provide required properties of uniformity and accuracy for long-life operation.

Talk over your roller chain needs at your nearby Link-Belt office or authorized stock-carrying distributor. Ask for Book 2457, covering this complete line of single and multiple widths, in ¼ to 3-inch standard pitch, 1 to 3-inch double pitch.

14,122

LINK-BELT gives you dynamic strength that comes from these important EXTRAS

PRE-STRESSING of multiple width chain provides uniform load distribution.



SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

CLOSER HEAT-TREAT CONTROL —coupled with rigid testing insures uniformity.

LOCK-TYPE BUSHINGS (applied on a range of sizes) end a cause of stiff chain.

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LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

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Fig. 1. Maintenance department supervisory personnel watch as Standards Department head points to work request form

Maintenance Gets Premium Pay Plan

Building, Equipment Conditions Improve Under Incentives

MUCH HAS BEEN DONE of recent years in the way of cost reduction in maintenance operations in industrial plants. Favorable results may be attributed to work simplification, planning, and record keeping. Relatively little has been done in the application of incentives which can be of benefit financially not only to workers but also to management.

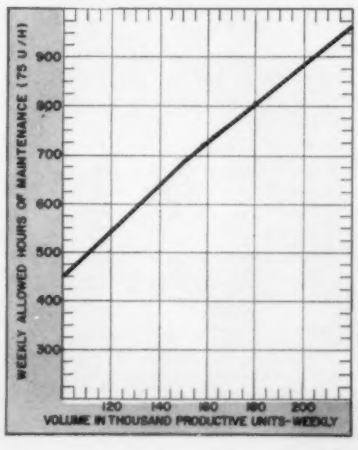
Some may feel that it is rather difficult to set up a workable incentive system for maintenance work. Conditions, of course, vary from plant to plant and complications of various degrees can arise. A lot of little details may enter into the overall picture. However, incentives are being applied to maintenance operations in a number of plants. One such system that has been highly successful is the one that had its start in 1948 at the Electro Refractories and Abrasives Corp. plant located in the Buffalo, New York, area. It has paid dividends in the reduction of down-time, improvement of work quality, and increased productivity.

In 1943, a consulting firm, Dyer Engineers, Inc., of Cleveland, Ohio, was engaged by the company to set up incentive standards for the production operations in the plant. This led to the extension of incentives to maintenance operations. Studies were made by the same consulting firm and allowable hours of maintenance work per certain volume of production were determined.

The curve that is shown in Fig. 2, establishes the number of man-hours that are to be used in calculating the premium earnings of each maintenance employee over a working week. This allowance covers the general maintenance and inspection activities pertaining to plant and equipment. The vertical scale on the chart reads in allowable man-hours and the horizontal one represents the total number of acceptable production units in a week's time. Of course, the amount of maintenance varies with the volume of production and the time allowance readings have to be adjusted.

If satisfactory execution of the required maintenance work and inspection consumes less time than has been allowed, the maintenance department receives credit for the difference. Should there be an excess of time expended, the department is debited in units equivalent to the hours and portions thereof over the allowed time. One might think, in retrospect, that this procedure would be a "natural" to encourage corner-cutting and slipshod work. If the maintenance work-

Fig. 2. Portion of curve for allowing maintenance time on production basis



ers have this inclination, they would only hurt themselves. Inferior work or careless inspection, or a combination of both would only encourage breakdown and even lead to serious trouble. As a result, the workers might have to spend quite a bit of time in one department.

In the event that a piece of equipment is taken out of production because of electrical or mechanical breakdown and there is no spare unit available for the same kind of activity, debits are charged against the maintenance department. These debits amount to the man-hours which were lost in production. If the men who are incapacitated by the breakdown of the unit can be employed in another production job, only one half of the production time is added to the maintenance department's total of debits.

In addition to the curve that presents allowable weekly time for building and equipment maintenance and inspection, there is an extensive chart, Fig. 3, that specifies amounts of time to be allowed for building work.

The numbers or fractions arranged horizontally in line with the words "building number" pertain to the frequency of inspection and maintenance, mainly to the former. For example, the fraction 1/1, under the entry, "Repair broken windows" means that a tour should be made once a year to inspect the condition of windows. The numbers in the column amount to the time that is allowed for work pertaining to each building specified. This time allowance covers repairs and replacement within a space of one year. Window maintenance work is done on a continuous basis, not once a year as it may have been implied. In the case of Building Number One, for example, the maintenance department is allowed 32 hours to repair windows.

In the group of columns under (inside work), the fraction 6/1 below the words "paint floor lines" means that the lines are to be painted six times during one year.

Maintenance workers can also earn premium wages on new construction jobs which include alterations. Jobs in this category require an estimate of labor and materials if they are expected to take more than 24 hours for their completion. Job estimates are one of the responsibilities of the maintenance superintendent, and are subject to the approval of the executive vice president. They have to be considered quite carefully inasmuch as the estimated man-hours become a "standard" of performance from which credits and debits are calculated. Accumulation of estimating experience has been reflected in good labor requirements forecasting. An example

HOURS OF MAINTENANCE PER YEAR (NOT INCLUDING INSPECTION)		OUTSIDE WORK									INSIDE WORK				
		Point up tile or brick	Repair or replace broken tile	Repair downspouts & gutters	Repair ventilators	Repair broken windows	Paint window frames	Repair roof	Paint bldgs. & Facilities generally	Paint walls & ceilings	Repair inside walls	Repair electric wiring & connections	Clean light shades	Repair or replace broken tile	Paint floor lines
Building No.	Freq.	1/2	1/1	1/10	1/1	1/1	1/1	1/1	1/1	1/3	1/1	1/1	2.4/1	1/1	6/1
										48.0	4.5	50	16	2.3	5.7
1 Cruc. Form. 6200		5.7	2.3	1.7	4.5	32.0	5.7	4.5	23.0	71.0	6.7	200	96	3.3	8.3
2 Cruc. Firing 9200		8.3	3.3	2.5	6.7	32.0	6.7	6.7	33.0	31.0	2.9	16	16	1.4	3.6
3 Per. Kiln 4000 - 2		3.6	1.4	1.1	2.9	2.9	3.6	2.9	14.0	68.0	6.4	75	12	3.2	8.0
4 Per. Kiln 8800		8.0	3.2	2.4	6.4	6.4	8.0	6.4	32.0	27.0	2.5	16	16	1.3	3.1
5 Tunnel Kiln 3500		3.1	1.3	1.0	2.5	2.5	3.1	2.5	13.0	29.0	2.7	16	24	1.3	3.4
6 Tunnel Kiln 3750		3.4	1.3	1.0	2.7	2.7	3.4	2.7	14.0	30.0	2.8	8	18	1.4	3.5
9 Refr. Press 3900		3.5	1.4	1.1	2.8	2.8	3.5	2.8	14.0	150.0	1.4	4	9	.7	1.7
10 Brick Press 1950		1.7	.7	.5	1.4	1.4	1.7	1.4	7.0	270.0	25.0	50	96	13.0	31.0
11 Ref. Tunnel Kiln 34,600 - 2		31.0	13.0	10.0	25.0	25.0	31.0	21.0	13.0	24.0	2.3	20	24	1.1	2.8
12 Reclaim 3100		2.8	1.1	.8	2.3	2.3	2.8	2.3	11.0	9.3	.9	20	9	.4	1.1

Allowed Hours 61 E.R.A. Job No. CS- #56 Date of Estimate: 3/22/55

Allowed Hours Approved by _____ Date Job Started _____

Estimated Date of Completion _____ Date Job Completed: _____

Description: Labor and material to install Hydraulic Cross feed on small Crucible Spinner.

Estimate Breakdown:	Hours
Install Hydraulic Pumping Unit	12
Install Hydraulic Cylinder	6
Revamp Cross Slide	8
Install Hydraulic Valves and Piping	10
Electrical Labor	22
Painting	3

MATERIAL:

1 - Racine Model "Q" Pumping Unit.)	
30 - gal. Reservoir, 3 HP. - 25 cy. 440 V - 3 ph.)	$ 490.00
1 - Tompkins & Johnson Hyd. Cyl. 4" bore x 8" stroke.	125.00
1 - Gardan Boot.	8.50
1 - #FGX-06-15 - 3/4" NPT Vickers Flow Control.	100.00
Change Solenoid Valve from 60 to 25 cy.	20.00
1 - Magnetic Starter & disconnect Switch.	90.00
2 - Push Button Switch.	13.00
Misc. Hydraulic Pipe, fittings, & hose.	30.00
Misc. Conduit, fittings, wire & steel.	25.00
MATERIAL	$ 901.50
MACHINING LABOR & O.H.	195.00
MAINTENANCE LABOR & O.H. 61 hrs. @ $4.75	289.75
TOTAL	$ 1386.25

Actual Hours Total Hours 61

Wk. Ending	Al. Hours	Balance	Worked	Notes or Reason for Delay

Fig. 3. Sample of chart entries of allowed times for building maintenance work
Fig. 4. Time given on estimates such as this one plays important part in plan

May 3, 1954

TO: Mr. C. F. Leitten, Executive Vice President

FROM: Mr. E. P. Yockers, Maintenance Superintendent

WEEKLY MAINTENANCE REPORT

Week Ending 5/2/54

There were no major breakdowns this past week. The Maintenance Department completed 41 routine repair requests, 8 emergency repair requests and 3 on buildings and grounds.

Weekly and monthly inspections have been made and inspection sheets are hereto attached, as are the annual inspection sheets.

One hundred and sixty-one hours were put in on new work and thirty-two and one-half on shipping containers.

The following new work has been completed:

JOB NO.	DATE COMPLETED	ALLOWED HOURS	HOURS TO COMPLETE	BALANCE
#6	4-11-54	160	129½	+ 30½
#9	4- 9-54	54	45½	+ 8½
#16	4-30-54	39½	29	+ 10½
#18-1	4-30-54	56	48½	+ 7½
#19	4-25-54	38	32½	+ 5½
#20	4-30-54	100	119	- 19
#26	4-30-54	64	88½	- 24½

EPY-k

encl

E. P. Yockers

Fig. 5. Time balances of new jobs are shown on report

Electro Refractories & Abrasives Corp
Maintenance Dept.

Monthly
Inspection Check List

Date 10/1/53
Division Grinding Wheel
Sheet 2 of 3
Last Insp. Date
Inspected by

Equipment or Building	Insp Date & Ints.	Lub. Date & Ints.	Repairs Needed On
Dust Collector System Finishing Dept.			
Lamie Grinder & Eqpt. Air Hoist			
4 Blowers - Dust Finishing Dept.			
5 Finishing Lathes - Meyer Small (42" 30" - 2 small)			
Shaving Mach. Crossley & Air Hoist			
Exhaust System - American Blower			
Shot Blder - Epworth & Eqpt.			
Center Beveling Machine			
Hand Handling System For Saggers			
Wahl Boring & Facing Mach.			
1 Yale 1/4 Ton Electric Hoist (For #1 Press)			
Hand Grinder Portable Black & Decker			
Spacemaster Stacking Truck (Grain Storage)			
9 Yale 2MC30 Lift Trucks			
1 Barrel Truck			
2 Lewis & Sheppard Lift Trucks			
2 Economy Keg Stackers			
9 Bluestreak Yale Trucks			
Monorail System (For Grain to Mix)			
1 Yale 1/2 Ton Electric Hoist (For #3 Press)			
21 Cutter Heads & Holders			
Mixer - Blen 40 -80- 120 Qt. (A M & F)			
Mixer - Hobart 3 - 10 Qt. (On order 10/13/53)			

Fig. 6. Check lists are used as maintenance inspection guides

of a typical estimate appears in Fig. 4.

At the end of each week, the maintenance superintendent submits a report to the executive vice president showing the time expended on construction jobs and their completion dates, Fig. 5. In the same sample report, mention is made of time spent on shipping containers. This is one of the extra jobs that come up during the year and payment for them is made on a straight time basis. They do not enter into the incentive calculations.

This maintenance incentive system also has provisions for weekly, yearly and monthly inspections of plant and equipment, Fig. 6. Failure to carry out an inspection is subject to penalty. The normal credit which would be gained from the performance of a particular inspection is deducted from the total accumulation of credits. Completion of inspection of items that are listed is indicated by entries of the inspector's initials and the date of inspection on the form. Comments regarding necessary repairs are also expected.

"Annual Inspection and Minor Repair Report" comes up each month for review by the executive vice president. All these inspection reports and the weekly maintenance report must be in the standards department office before weekly premium wages can be calculated.

Premium earnings are posted once a month. This period may include a four or five week length of time depending on which week is closer to the end of the month. The form on which the monthly base pay, overtime and premium earnings are posted appears in Fig. 11. At the bottom of this form is a typical calculation of the performance factor which can also

Fig. 7. Premium plan covers press hydraulic system repairs

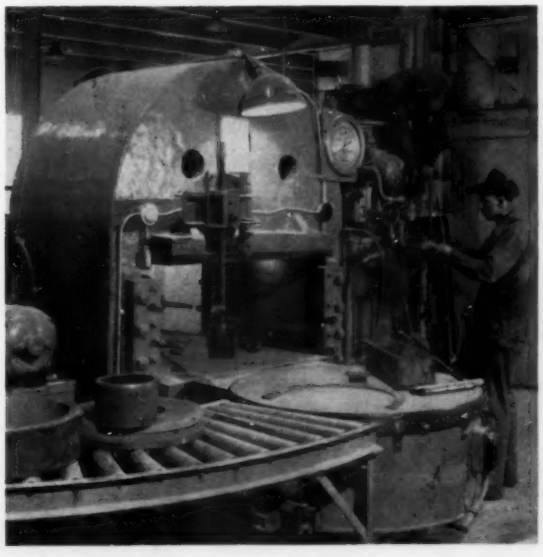


Fig. 8. Maintenance department takes care of instruments

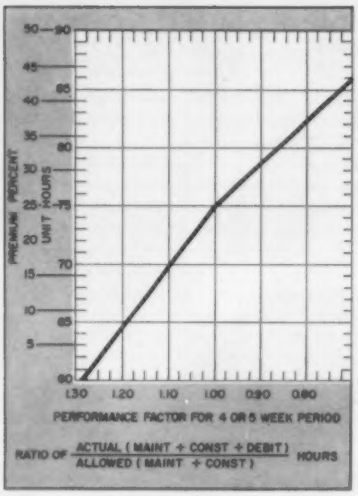


Fig. 9. Relation between performance factor, unit-hours, premium percentage

be translated into a "unit-hour" rate figure signified by U/H. It may be well to point out that in this plant a standard of unit production effort is equivalent to one minute of work. Accordingly, a 60 unit-hour is considered to be a standard unit-hour of work. If the production worker produces at a rate above this, he is paid a 100 per cent premium for each unit-hour in excess. In other words, the incentive is not paid on a percentage of each unit-hour above the 60 unit-hour rate but for each entire unit. A production rate of 90 U/H, for example, merits a 50 per cent premium over base pay with a 100 per cent payment for each of the 30 unit-hours over the standard rate.

The first number in the denominator is the total of the figures in the last line of the form, Fig. 11. Each of these component figures were picked off the curve in Fig. 2, against the weekly production volume in thousands of units. The second number in the denominator is the total number of hours which were allowed for construction work over the period of time under consideration.

The sum of the numbers in the line entitled "Total Hours Maintenance" appears as the first number in the numerator. It is the amount of time charged to maintenance assignments over the five week period. The second number in the numerator designates the total hours expended on construction work. The third number in the numerator is the total of debits accumulated during the month.

In this case the performance figure of 0.68 is quite good. Premium earnings are reflected inversely with the value of the performance factor. As the factor decreases from 1, the premium percentage improves. This can readily be seen from the curve in Fig. 9. Production with a performance factor over 1 is considered to be below a normal level.

The inclusion of the maintenance superintendent in this plan contributes in no small measure to its continuous successful application. Efficient use of labor as well as supplies is reflected in the premium paid on maintenance costs per one thousand production units. Although the incentive earnings of the superintendent are calculated on a yearly basis, he can draw these benefits quarterly. A tabulation of the maintenance costs (material, labor and overhead) per one thousand production units over a five year period gives an idea how well this arrangement has been working:

Year 1951	—	$30.837
1952	—	28.481
1953	—	28.247
1954	—	21.577
1955	—	18.665

This gradual decrease of costs is all the more impressive when one considers the fact that labor and material have been steadily on the increase in this country. In this plant, not only has there been a reduction in costs over the five years mentioned but also improvements in the conditions of buildings and equipment, dividends of this maintenance incentives plan.

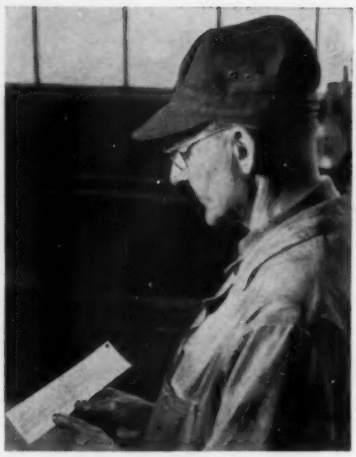


Fig. 10. Employee points to figures of premium wage on a typical check stub

Fig. 11. Premium pay over a five-week period appears in extreme right column

Electro Refractories & Abrasives Corp. — 4 or 5 wk. per ending 12-4-55
Buffalo, New York — PROGRESS REPORT & CALCULATION FORM
Maintenance Department — by Standards Department

Week Ending	11/6/55		11/13/55		11/20/55		11/27/55		12/4/55		Base	Over	Premium
Employee Name	Hrs	Pay	Hrs	Pay	Hrs	Pay	Hrs	Pay	Hrs	Pay	Pay	Time	$
Doe, John	40	73.60	38	69.92	40	73.60	38	58.88	25½	46.92	322.92		138.86
		5.82				9.70		3.88		1.94			9.18
Smith, Peter	46	89.24	40	77.60	50	77.60	38½	74.69	34	65.96	385.09	21.34	165.59
Greene, Bob	40	81.60	38	77.52	32	65.28	32	65.28	29	59.16	348.84		150.00
Raye, John	38	63.08	38	63.08	23½	39.01	32	53.12	16	26.56	244 85		105.29
Brennan, Jim	40	70.40	38	66.88	40	70.40	32	56.32	33½	58.96	322 96		138.87
		2.91		6.31		9.70		2.67		7.76			12.62
Sheehan, Bill	43	83.42	41⅛	80.03	50	97.00	32⅜	63.54	40	77.60	401 59	29.35	172.68
Bernez, Steve	40	73.60	38	69.92	40	73.60	24	44.16	32	58.88	320 16		137.67
Rutten, John	40	73.60	38	69.92	40	73.60	24	44.16	-	-	261.28		112.35
May, Joe	40	66.40	38	63.08	40	66.40	32	53.12	37	61.42	310 42		133.48
Basil, Larry	40	77.60	38	73.72	32	62.08	32	62.08	37½	72.27	347 75		149.53
		7.76						7.76		.84			6.78
Welchoff, Jack	48	93.12	38	73.72	32	62.08	40	77.60	40½	78.09	384 61	15.76	165.38
		6.64						6.64					5.71
Brown, Joe	48	79.68	38	63.08	39⅜	65.99	40	66.40	25	41.50	316 65	13.28	136.16
				8.28									3.56
Rogers, Dan	38½	74.69	45½	88.27	40	77.60	32	62.08	-	-	302 64	8.28	130.14
								3.08					1.32
Mandiak, Ray	-	-	16	28.16	40	70.40	35½	62.48	24	42.24	203 28	3.08	87.41
Schmidt, Geo.	-	-	16	28.16	39⅜	69.96	32	56.32	24	42.24	154 44		66.41
Production	2½	4.69		1.41	-	-	-	-	-	-	6 10		-
													70.72
Total Hours Maintenance	614½		584⅜		671⅜		604½		524		6,640 85	164.48	2,852.94
Total Hours Construction	123½		207½		169¼		83		36½				
Total Plant Productive Units	222,757		224,388		221,976		204,244		194,995				
Maintenance Hours Per M Units	970		977		970		899		860				

Calculation of Performance Factor — Chart II

	Maintenance	Construction	Debit	Total	Performance	
Actual	2999	620	1264	3745½	68	43 % Premium
Allowed	4676	* 795		5471		86 U/H

Base Pay $ 6,640.85 — Net Cost Per M 6.2159 — Total Pay $ 9,728.99 — Gross Cost Per M 9.1064

Plant Units 1,068,360 — Plant Units 1,068,360

* Boxes: 100
Const: 620
Gained: 75

IF YOU WANT GOOD WELDS LIKE THIS, MAKE SURE YOUR EQUIPMENT IS WELL MAINTAINED.

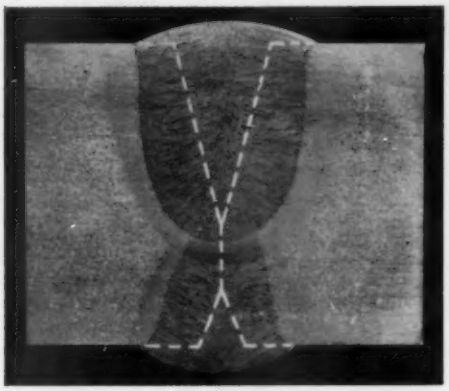


Fig. 1. Uniformity of the cross-section of this weld catalogs it as being one of superior quality

To Maintain Them, Know Them

Only Familiarity Should Breed Attempt in Welder Maintenance

By H. G. THOMA, Linde Air Products Co., Newark, N. J.

ALTHOUGH OFTEN neglected, maintenance is a problem confronting all users of automatic electric welding equipment. And knowledge of the overall function of any equipment is a basic requirement for successful maintenance. When a man is called upon to maintain or shoot trouble on a crane, he knows what the crane is required to do.

An example will illustrate why so much emphasis is placed on the value of knowing the overall function of the equipment: Recently, a welder was requested to make a sigma weld on one of the alloy materials. He embarked upon this assignment with instructions to use a specific grade of welding argon. He found that if he followed his instructions, he could not make a successful weld because his arc voltage fluctuated wildly. His immediate reaction was to blame the control.

So a specialist on the control was called in and could find nothing wrong with the equipment. He suggested that the control be proved, good or bad, by welding with a mild steel welding wire that had been used in the final acceptance testing of the control. The result of this test indicated that the control was in good operating order. It was subsequently learned that the operator was using the wrong grade of welding argon.

Welding equipment is used to produce a fused joint—this is its basic function. The components of a welding installation are actually no mystery to electric maintenance engineers. Parts of a welding installation are merely variations or adaptations of very ordinary electrical equipment. Principal components are power supply, torch, welding head, and control. The power supply in an electric-arc welding station may be one of several types.

For example, a welding transformer is fundamentally the same as any power transformer except that it is designed to handle higher currents at low voltage. It usually has an inductor for limiting the flow of current through the secondary winding to a predetermined value.

A welding generator is analogous to a power generator or to an automotive generator. It may be driven by an electric motor, gasoline or diesel engine. It operates on the same principles, either as a series, shunt, or compound generator. The chief difference is the magnitude of the currents it is called up to deliver, and the volt-ampere characteristic. A third type of power supply has become popular in recent years to eliminate the problems pertaining to rotating equipment such as a generator. There is an axiom among maintenance people that a moving part is a potential source of trouble.

To obtain a source of direct current power, a number of manufacturers now use dry plate rectifiers. In a common housing are contained a step-down transformer, a reactor, and a bank of dry oxide rectifiers. The rectifiers are large models of those used in private telephone systems, such as the PAX.

In order to transfer the welding current from the power supply to the welding wire, a torch or nozzle is used.

A welding head is a device necessary to motivate the electrode. It contains a variable speed motor, gear reducer, and a drive roll. It functions like the motor and hoist drum on an elevator or a V-belt drive.

The welding control governs all welding services such as the flow of welding current. It starts, stops, and controls the speed of the motor in the welding head. It contains standard components such as transformers, condensers, resistors, chokes, and dry rectifiers found in a radio or television set.

While important to consider each component in itself, it is more important to keep sights on the objective of the installation—which is to make a weld. Figure 1 shows a cross section of a good weld. Note the uniformity of the weld area. Welds are made by the application of heat or pressure or a combination of both, as in resistance welding. Another, the arc process, normally depends on heating the parts until the interfaces are fluid and then permitting the molten parts to flow together. The prime function of the arc welding processes discussed here

Fig. 2. If compressed air won't clean control boxes, complete job with soft brush

is to introduce controlled heat to the junction of two or more pieces of metal. The joint must be uniform in size, shape, and physical appearance; it must also be of high quality.

Heat is the result of an electric arc caused by the passage of a current through a gap between electrodes. To attain the desired uniformity the heat input per unit length of weld must be uniform. Low heat input per unit of length will keep distortion low. All of this requires accurate control of the relative motion between the arc and the work.

When maintaining any kind of equipment we are trying to prevent equipment failure. Generally speaking then, welding equipment is beset by the same difficulties as any other electrical installation. It must be kept clean and must not be subjected to moisture, dust, or other contamination. It can be damaged by mechanical shock, and operates best in moderate temperature with a minimum of dust and moisture.

These are difficult objectives to attain in many shops. When such aims cannot be achieved, one can only do his best. This means to keep the covers closed on all control boxes to exclude dust as much as possible. A bag of silica gel inside a box will reduce humidity. However, we know of no installation where this has been necessary.

In extreme heat, it is advantageous to aim a fan or an air blast at the control box to reduce the temperature. This is not as necessary when xenon-filled thyratron tubes are used as with mercury vapor thyratrons. This, of course, is due to the wider temperature range that is characteristic of xenon tubes. Under extremely low temperature conditions, it is sometimes necessary to equip the control with an auxiliary source of heat such as a 100 watt lamp or space heater.

To maintain an automatic welding station properly, one should study installations which are operating satisfactorily. One cannot expect to guard against equipment failure unless he knows what the equipment can do. He cannot guard against his own failure without a working knowledge of electronics. The manufacturers of the welding equipment expend considerable effort in the preparation of instruction literature.

Men responsible for the upkeep of automatic electric welding equipment should be familiar with the equipment. This familiarity can only be attained by a thorough study of it and the literature as well. Instruction literature and field service help can always be obtained from the nearest office of the manufacturers.

Good maintenance practices are essentially a matter of good housekeeping. Motor windings should be blown out at least once every two weeks—oftener, if need be. As oil or other lubricants start to accumulate in motor frames or generator frames, suitable washing with a solvent such as carbon tetrachloride is necessary. If a motor has to be washed more than twice a year, fix the oil leaks. Motor or generator brushes and relay contacts should be inspected regularly. If they do not seat properly, normal seating practices should be followed. For this purpose, standard seating stones or fine sandpaper should be used.

Control boxes and control panels should be cleaned once a month—oftener if the box is in a dusty location—using a clean, dry camel's hair brush to loosen dirt that does not give way before a blast of compressed air. See Fig. 2. The compressed air should be clean and dry—which means that the air line should be blown down to

Fig. 3. Contact surfaces of lugs and other connections should be bright, clean

Fig. 4. Good example of control and power cables properly racked and clamped

get accumulated moisture out of the line before using the air on electrical equipment.

All electric connections should be kept clean and tight. When lugs on welding cables are bolted together, the contact surfaces of the lugs should be sanded or wire-brushed clean and bright, as in Fig. 3, before the connection is made. It should be remembered that the resistance encountered in a heavily oxidized connection produces a large voltage drop when there is a high current flow. Be sure the signal leads are securely fastened. Poor or broken connections to the grounded workpiece are probably responsible for more breakdowns than any other single cause of trouble.

When working with inert gas equipment, it is essential that all water and gas connections be tight. Leaks are costly and wasteful. Water leaks in control boxes can cause serious damage. An example of a good installation is shown in Fig. 4.

Always use the proper tools. Do not use a pair of pliers on a nut or cap screw when a proper open-end wrench will do the job. The wrong tools or wrenches will not only damage equipment, but on energized equipment can cause short circuits.

Take the necessary steps to prevent mechanical injury to electrical connections. Be sure proper strain relief devices are used wherever indicated. Be certain control and power cables are properly racked and securely clamped in place. Considerable down-time has been caused when a terminal has supported an accidental mechanical load that should have been taken by a protective sheath through a protecting strain-relief device.

Good maintenance dictates that one should not expect all parts to last indefinitely. Referring to electron tubes, however, we can generally expect them to last at least 10,000 hours—that is to say, for 10,000 hours of arc time. Idling time has no effect, even though the heater is energized. To prevent failure of equipment from this source, it is recommended you consider replacing such tubes after they have been in service for that length of time. Where bias batteries are used, it is well to replace them every six months at least.

If the control contains a variable auto-transformer, the brush tracks should be kept clean and in good order. To do so, the manufacturers of these devices recommend oxide removal with a fine sandpaper such as 2/0, or finer, grit. The tracks should then be cleaned with a carbon tetrachloride-soaked rag. (However, when using carbon tetrachloride, be sure that it does not constitute a health hazard due to insufficient ventilation or over-exposure to its fumes.) The tracks should be given a thin coating of heat resistant inert grease, such as a Dow Corning silicone-grease type DC 44. Once a week is sufficient for this, if the duty cycle is 50 per cent or less.

It is essential that welding jaws, nozzles, or guide tubes be kept clean at all times to avoid large contact voltage drops. Jaws can be cleaned with fine sandpaper or steel wool; 2/0 grit or finer has been found satisfactory. Remember to blow sand or steel wool particles away before using the cleaned parts. Nozzles and guide tubes can be cleaned by running the proper size twist drill through them. It may be necessary to clean contact devices once a shift if the duty cycle is greater than 50 per cent. When cleaning these devices, it is important to bear in mind that, with cleaning and normal operating wear, the size will change. As the parts wear out and the size in-

(Continued on page 208)

Fig. 5. Test instruments should be used, not "by guess and by gosh" maintenance

Three phases of construction: left, original building; solid outline, first expansion; dotted outline, current program

This Plant Won't Stop Expanding

But Materials Handling System Keeps Pace

By PHILLIP HOEL, Plant Manager, Construction Machinery Div., Clark Equipment Company

WITH ITS second expansion phase nearly "under its belt", the Clark Equipment Co.'s Construction Machinery Division plant in Benton Harbor, Michigan, proves the value of planning—particularly in the field of in-plant materials handling.

Originally designed and completed in October, 1954 as a 150,000 sq ft plant, the building has been enlarged by 60,000 sq ft in one addition and is currently undergoing a second addition—this one 125,000 sq ft, almost doubling the total production area.

Fortunately, early planning and design included this expansion, and flexibility was the keyword in the plant layout. As a result, easy adaptation of plant facilities has followed completion of the expansions.

To obtain maximum efficiency in the handling of the great variety of components and parts needed in the fabrication and assembly of the "Michigan" tractor shovels and excavator cranes in the plant, Clark relies on: a plant layout designed for logical, orderly flow of materials from the initial processes through final assembly; a centrally located storage area for small parts, easily accessible to all work areas; an integrated system of cranes, conveyors, fork trucks and straddle carriers to give sufficient capacity and mobility to handle all materials quickly; extensive use of portable racks, bins and pallets for in-process storage; separate facilities for receiving raw steel and parts and supplies.

The basic materials handling problem is that of establishing methods flexible enough to handle both heavy, awkward components and small parts. A second problem is that of maintaining a smooth flow of materials to the primary work areas, while at the same time servicing the several smaller sub-assembly stations clustered in the center of the plant.

Building Design

Emphasis on functional design was an important step. The 32-ft building height allows crane-hook clearances of 20 ft, permitting in-plant handling of the largest components. Aisles are 12 ft wide (a width determined by studies to best facilitate maneuvering by mobile handling equipment) and building columns are kept to a minimum.

The three main operations performed in the plant are fabrication and forming of steel into main components, welding and sub-assembly, and final assembly. The general plan calls for movement of large components by crane and conveyor, with fork trucks and straddle carriers handling smaller, more mobile parts. Deviations from this plan are frequently made to meet special situations, and the ability of the system to do this is an important efficiency factor.

Major stationary handling equipment includes nine overhead cranes ranging in capacity from three to ten tons and in span from 40 to 60 ft, and several one- and two-ton bridge cranes and jib hoists. Over 80 per cent of the total floor area is serviced by these overhead handling devices. A 10,000-lb capacity Jervis B. Webb powered-and-free conveyor, 260 ft long, carries large components from final welding through a Pangborn shot-blast room.

Mobile handling equipment includes eight gas-powered fork trucks of 2000 to 15,000-lb capacity and a straddle carrier of 7000-lb capacity.

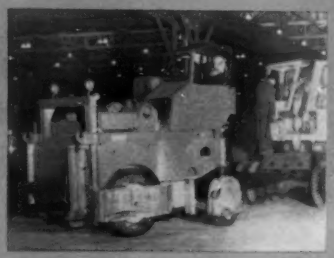
Separate receiving facilities are provided for steel, because crane handling of steel and trucking small parts in the same area would cause confusion and interference, and handling time is reduced by unloading as close as possible to initial storage areas.

Raw steel is unloaded from trailers by an overhead crane. Long lengths are placed in horizontal ten-foot racks, which are nested to conserve floor space. Individual pieces are removed by crane and deposited near machines for processing.

Overhead handling of bar stock is done with portable, nesting racks

Fork truck, jib and overhead cranes cooperate in the final welding area

Central storage area for small palletized parts is in center of plant



Straddle carrier takes over chore of handling long and bulky components

Portable racks with removable wooden deck are for odd-shaped parts

Drill fixtures are palletized and put into a numbered rack for storage

nents are lifted by crane to the conveyor to the shot blast room. Leaving here, the pieces are picked up by a crane and deposited at a paint booth for a prime coating. Then they are palletized and carried by fork truck to the final assembly area.

At the final assembly areas, parts and supplies are stored on pallets and in bins; the containers are carried to and from central storage by fork trucks. An important result of this portability is the ability to meet varying production requirements of the ten Michigan models, any of which can be assembled on any of the nine assembly lines in the plant.

Straddle Carriers, Too

Several other techniques contribute to efficiency; one is the use of outside storage for excess raw steel and large members, with a straddle carrier for handling. Although a high-capacity fork truck is sometimes used, the straddle carrier is more speedy and mobile over the rough terrain.

In the fabrication areas, numbered racks are used for storage of palletized dies and drilling fixtures.

In planning its materials handling procedures to fit the future, Clark employed methods that can be easily broadened as the size of the plant increases. That's one reason for the extensive use of portable racks and bins, and the emphasis on a highly mobile fleet of fork trucks and straddle carriers. As the plant grows—and experience shows that it is doing just that—materials handling methods will grow.

For mobility and flexibility, pallets and portable bins and racks are used extensively. Materials are assigned to each type of carrier according to size and frequency of use. Standard wooden pallets are used, some with sides to hold round pieces too long for bins.

Parts moving directly from the dock to in-process storage are on pallets. Other parts are removed to central storage and placed in bins which are then moved to in-process storage.

Portable racks, tiered to conserve floor space, are used as storage bins in the central storage area. Open on two sides, the racks can hold several pallets, depending on the volume piled on each pallet. Whole racks can be moved, or individual pallets removed and delivered.

While fork trucks have sole responsibility for handling smaller parts, they are coordinated with the extensive crane work in handling large components. Generally, transferring of components from one work area to another is done by cranes because of the shapes and weights involved.

After final welding, heavy compo-

Final assembly line utilizes overhead crane, jib crane and fork truck handling

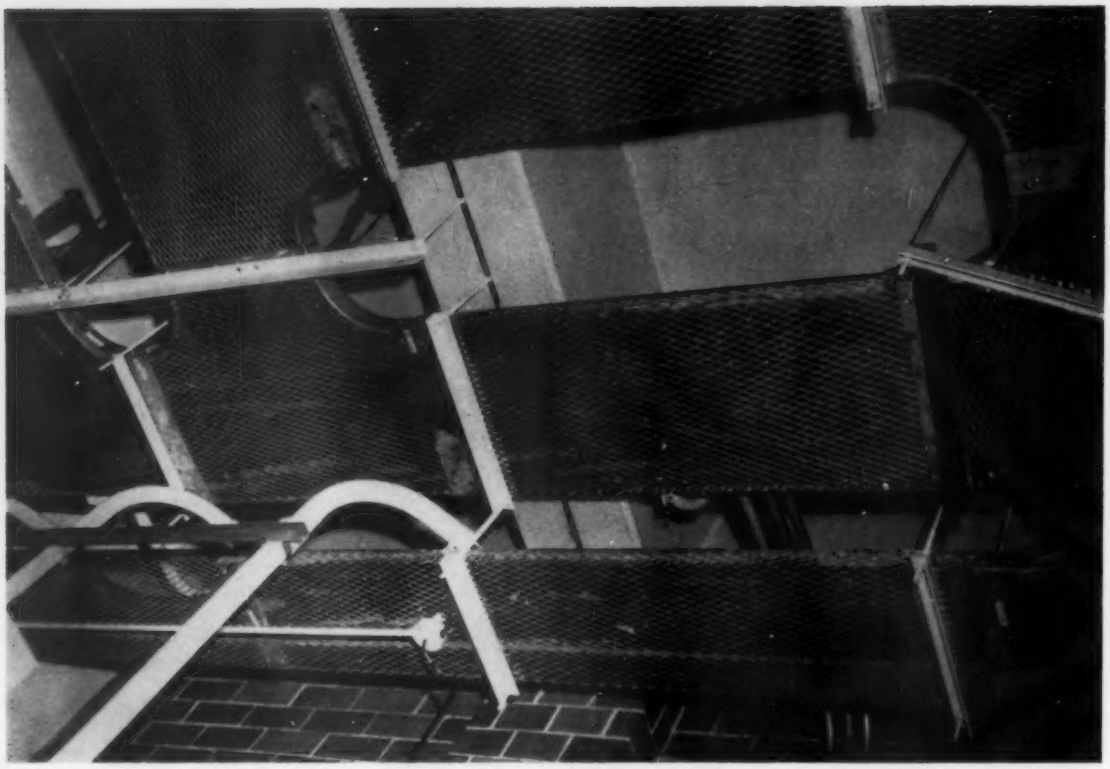


Fig. 1. The great variety of fittings available for use with this expanded metal cable trough permits great flexibility

How Scott Paper Handles Power Cables

REDESIGN AND modernization of the power distribution systems in three of their company's mills gave Scott Paper Company engineers a fruitful opportunity to examine costs of installation. One of the elements that came under their very sharp pencils was that of cable supporting systems. The resulting figures told them to use cable troughs.

Advantages turned up by Scott engineers were: savings in installation costs due largely to decreased labor, savings in materials and space, and greater flexibility in installation. Last, but not least, the cable trough permitted higher current ratings. Thus far the Scott engineers have installed cable trough in three of the company's facilities: the Everett, Washington, mill; Winslow, Maine, and Detroit, Michigan, plants. At Everett more than 500 ft of trough have been installed to support the cable leading to four paper machines.

As pointed out above one of the biggest factors involved in the savings is the increased current-carrying capacity of the cables when supported in troughs. For example, a 600-v line in the Everett plant, carrying 285 amp would require 500 mcm cables in conduit as opposed to a 350 mcm cable in a trough. This trough rating is for double-stacked cable with an 0.8 air rating allowance for double stacking.

Scott's current ratings are conservative. They are based on an ambient temperature of 50 C when 40 C is usually considered ample for this type installation. Scott engineers have allowed for the extra temperatures that may be encountered over calender rolls, pulp driers and other equipment, by calculating the maximum temperature exposure and basing the entire circuit on this maximum that may be present only in one small area.

Tables I and II compare current-carrying capacities and cable sizes.

Method of installing cable trough at the Scott plants is an interesting procedure. Crews with power saws and welding equipment assemble several lengths of trough on the floor and lift the entire run into position. This is readily accomplished because the cable trough used, Cope Expanded Metal, weighs only 36 lb for a 10 ft length. This compares more than favorably with rigid wall conduit of equal cable-carrying capacity. Seven 4-in. conduits of this type are needed to carry the same amount of cable as one 12-in. metal trough and 10 ft of seven such conduits would weigh 630 lb. In time savings, too, there is considerable difference. Connecting two sections of trough takes no longer than connecting two sections of conduit.

Table I. Cable size at constant current

Current	Conduit	Double layer in trough—0.8 of air rating	Single layer in trough—Full air rating
225 amp	350 mcm	250 mcm	200 mcm

Table II. Current rating with constant cable size (122 F ambient temperature)

Cable Size	Conduit	Double layer in trough—0.8 of air rating	Single layer in trough—Full air rating
400 mcm	252 amp	327 amp	400 amp
500 mcm	285 amp	371 amp	464 amp

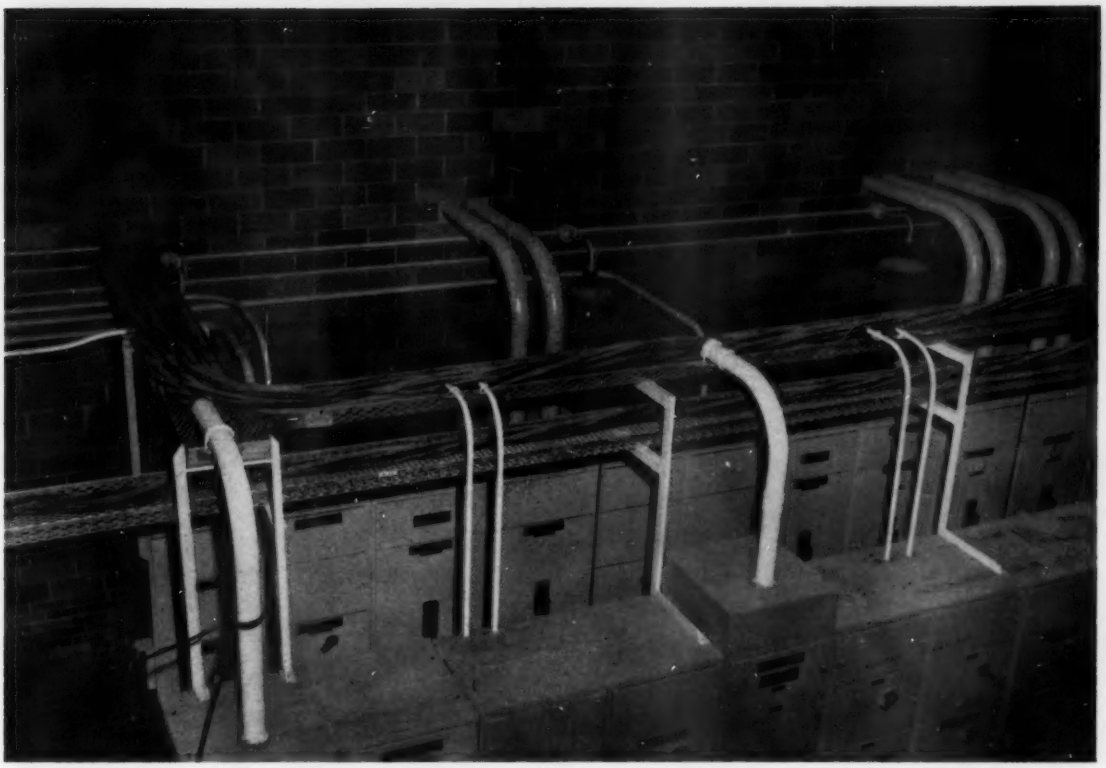


Fig. 2. Power and control cables fed to switchgear in a Scott Paper Co. installation are readily accessible for additions

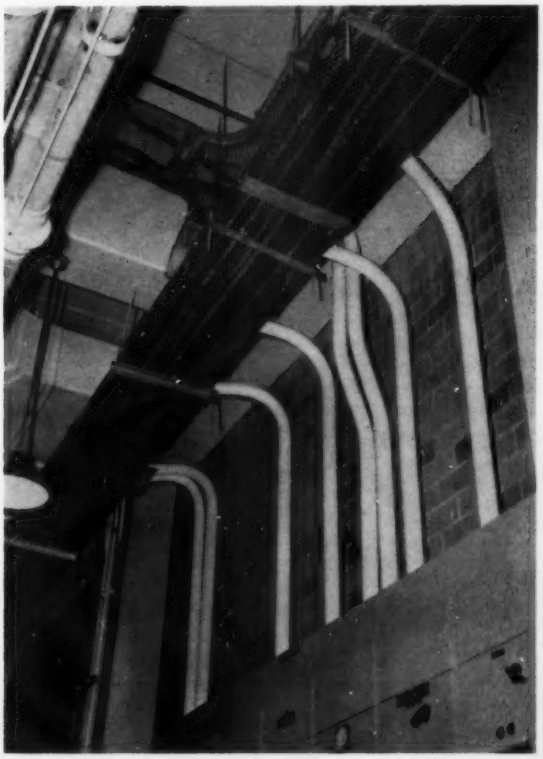


Fig. 3. Trough installation viewed from below. Drop-outs can be placed at any point without first cutting or fitting

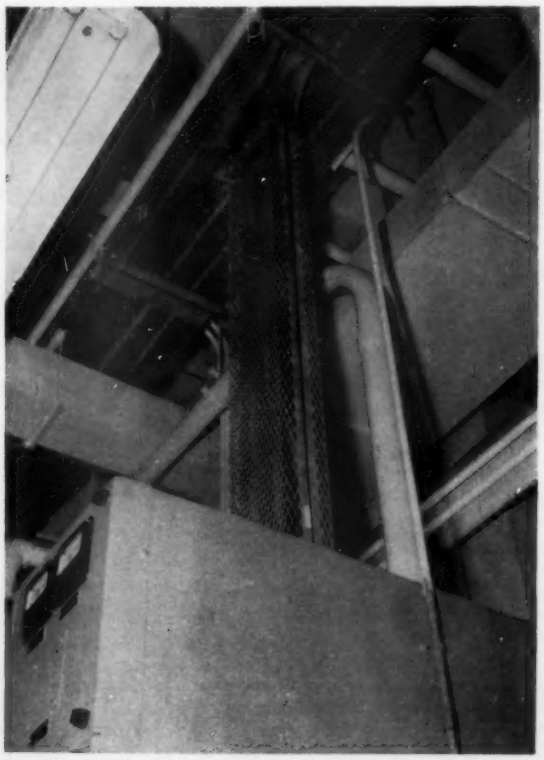


Fig. 4. Cable trough forms a closed drop-out for high concentration of cables going into switchgear panel cabinets

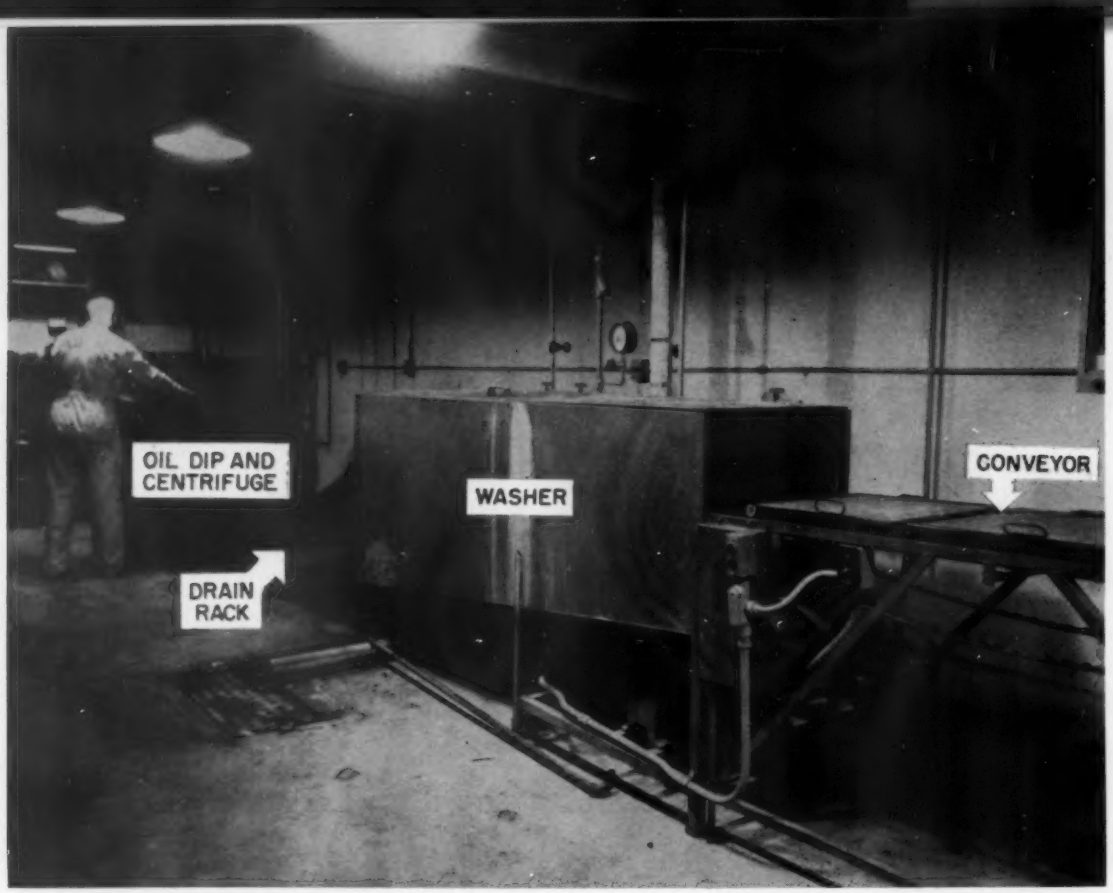


Fig. 1. Overall view of filter washing and oiling equipment. Filters start at right of picture and travel to oil dip at left

Filter Washing and Oiling

Sandia Analyzes Costs; Amortizes Installation in Ten Months

By H. H. BAXTER, JR., Plant Engineering, Sandia Corporation

ABOUT A YEAR AGO, Sandia Corporation's new building and construction activity began to level off. The majority of these new structures have ventilation or air conditioning systems. Most of the air handling systems incorporate some type of filtering device, usually a permanent, washable, impingement-type air filter.

Although these filters require frequent cleaning for proper operation, they require less space, do a better job on our particular applications, and cost less initially than other types of filters, such as the moving screen with oil bath. In our case, the use of filters having the lowest initial cost was established by AEC design criteria.

During the early phases of extensive permanent type building construction, little thought was given to maintenance of the filters until it became evident that existing cleaning procedures were inadequate because of the work volume.

Method employed at that time consisted of cleaning the filters with a hand-operated detergent-lifting steam gun, followed by applying low viscosity oil with a paint brush, and then spinning the filters in a homemade centrifuge to remove the excess oil. Since we were unable to clean filters frequently enough, they became loaded and failed to pass design cfm. This resulted in inadequate performance of evaporative cooling systems, which rely on passing large quantities of air. In those instances where dirty filters were removed from banks so that the necessary cfm would be regained, dust entering work areas became a problem, particularly during the dust storms which are common to the Southwest.

Fig. 2. Close-up view of filters emerging from washer and being placed in oil dip tank located near end of line

It was then decided to establish a regular cleaning and oiling schedule for the filters. A bid of 75 cents per filter was offered by a firm engaged in filter cleaning. An estimate by our Plant Maintenance Department indicated that it would be most economical to buy the cleaning and oiling equipment and establish our own plant. Comparative costs (Sandia vs. an outside contract firm) were not compatible because of the extra costs incurred in paying an armed escort to accompany

workers from a commercial firm. Most of the filters were located in restricted technical areas.

Equipment was purchased and installed as indicated in the photograph. Four men were assigned to work under the third shift maintenance supervisor from 12:00 midnight to 8:00 a.m., with the thought that all pieces of air conditioning equipment could be shut down during those hours. It was anticipated that these men might spend four hours each night on impingement-type filters.

The balance of the time could be spent hosing-down equipment rooms, cleaning sumps on moving screen type air filters, miscellaneous sandblasting, cleaning out air washer tanks, and other work generally done by higher paid personnel on an irregular basis during daytime hours. Thus, the filters would be cleaned on a regular basis, and other miscellaneous cleanup work could be done regularly during off hours by lower paid personnel.

Cleaning and oiling equipment has a conveyor which moves the filter into the washer section, dirty side up. Here a set of water nozzles rinses off all loose dirt into the sewer. In the next compartment, four sets of nozzles spray a 190 F detergent solution with a pH of 11.65 on the top and bottom of the filter. It was found to be more economical to use a special non-foaming chemical with a long life in lieu of cheaper standard detergents. The spray tank holds 100 gal of solution, which is recirculated by a 7½-hp pump. The filter then runs through the after-rinse of water, and then onto a sloping drain rack, where it is left until most of the water has drained.

Next, the operator immerses four filters in the adhesive material and holds them 10 seconds, or until the metal is at the same temperature as the oil (about 200 F). These four filters are then placed in the centrifuge cage to spin off excessive adhesive.

A timer controls the duration of spin so that about 12 ounces of adhesive remain on each filter. This coating has a wicking property which keeps an oily surface constantly exposed to the air stream, even when the filter is loaded with dirt. An indication of the effectiveness of this coating is the fact that a single 20 in. by 20 in. by 2 in. filter will pick up as much as 1½ lb of dirt in a dust storm.

Cost breakdown at the right is based on eight months of actual operation. Excluded are such intangibles as decreased efficiency of air conditioning and thus of working personnel due to dirty filters, and additional expense for janitor time caused by missing filters permitting dust to enter.

1. Costs for One Night's Cleaning Operation

a. Labor	
16 man hours per night at $1.75	$28.00
b. Electricity	
No demand penalty 12:00 midnight to 8:00 a.m., basic charge of $0.0065 per kwh. Assume 1 kw per hp; assume all motors on; ¾ hp centrifuge, ¼ hp oil transfer pump, 7½ hp pump, ¼ hp conveyor, or assume 10 hp. 10 x 0.0065 x 4 =	0.26
c. Detergent	
Kelite PWB-81 at $0.275 per lb. A 12-lb charge in washer tank will wash approximately 125 filters. Machine will wash 55 per hr or 220 per night. Assume two charges of Kelite. 24 x 0.275 =	6.60
d. Steam	
Assume approximately 200 lb per hr, or 800 lb per night at $0.36 per 1000 lb.	0.29
e. Water	
Two 100 gal charges in tank 4 gpm pre-rinse 4 gpm after-rinse 380 gal to clean-up area Total 2500 gal at $0.08 per 1000 gal. =	0.20
f. Adhesive	
Calol Filter Coat (flash point 350 F, melting point 190 F) at $0.085 per lb. 12 oz or ¾ lb per filter x 220 x 0.085 =	$14.03
g. Total Cost—220 filters in one night	$49.38

2. Unit Cost

$49.38 ÷ 220 = $0.224 per filter

3. Original Installation Cost of Filter Cleaning Equipment

a. Far-Air heavy duty filter oiler with ¾-hp centrifuge motor and ¼-hp oil transfer pump	$1,283.00
b. Far-Air heavy duty filter washer with 7½-hp recirculation pump and ¼-hp conveyor motor	1,633.00
c. Freight on above items	75.63
d. Structural contract to revise building for filter cleaning	1,778.00
e. Electrical contract to install new substation and rewire building for filter cleaning	1,810.35
f. Work order to install and pipe new equipment (installed by Sandia maintenance force) Material	458.23
Labor and Overhead	1,357.00
Total	$8,395.21

Note: Floor rental for the area not included.

4. Amortization

1600 filters cleaned once a month
$0.75 — 0.224 = $0.526 saved per filter
$0.526 x 1600 = $841.60 saved per month

Round-the-Clock Fire Detection

System Links Plant, Protection Service, Fire Department

OBTAINING ADEQUATE fire protection at moderate cost presents a problem to the average small and medium size plant. Mobile or portable extinguishing equipment is vital, but only large plants operating on a continuous schedule can be assured that personnel will be on hand during evenings and weekends to spot a fire and use the equipment. In many cases automatic sprinklers provide an excellent round-the-clock safeguard, but such systems require a larger investment than many small companies are prepared to make.

A practical solution to the question of protection versus cost is the fire detection system which is continuously monitored via direct circuit, by a centralized protection service. Such a system is installed at Hunter Engineering Co. of St. Louis, Mo.

Hunter Engineering manufactures equipment for dynamically balancing and aligning automobile wheels. Plant facilities include two adjoining one-story buildings totalling about 25,000 sq ft, which house the manufacturing, warehousing, testing and administrative activities. Although the operations are essentially metalworking and assembly, there are nevertheless a number of points in the manufacturing area which are potential fire hazards. These are the paint booths, paint drying ovens, paint storage locations, gas-fired vapor degreasers, inflammable stores, as well as the general manufacturing area where electrically-driven equipment is in constant use. The main plant is of concrete block construction; the adjoining building is of brick construction, with a wooden-beamed ceiling and corrugated metal roof.

Although the buildings themselves can be considered to be reasonably fire-resistant, the destruction of General Motors' well protected plant at Livonia demonstrates that few plants are really immune to extensive fire damage. The Livonia fire taught many lessons about building construction, fire fighting techniques and above all, the need for timely reinforcement by organized fire fighting apparatus. But what of the plants already built, and especially the majority of smaller plants that cannot afford to maintain their own round-the-clock fire fighting crew? This is how Hunter Engineering, with a working force of less than 100 persons, has answered this question.

Hunter Engineering's protection is based on plant facilities, automatically supplemented with external help. Initial resources are the plant's portable fire extinguishing equipment, such as hand extinguishers and fire-fighting tools located in the areas of greatest fire hazard. Fire doors between the various manufacturing and warehousing locations help isolate the affected part of the plant in case of fire. This equipment is supplemented with an automatic fire detection system continuously monitored at Potter Electric Co., a fire and burglary alarm service in St. Louis, Mo. The Potter system dispatches municipal fire apparatus to the scene as soon as an alarm is received, thus placing the emergency in the hands of trained fire fighters without delay.

Alarm Circuit

The heart of the detection system consists of 73 Fenwal Detect-A-Fire units located throughout the Hunter Engineering plant and wired into an alarm circuit. All strategic locations are covered by: 62 detectors, set to actuate at 160 F, mounted on the ceiling of the general manufacturing, warehouse and work areas; 4 detectors, set at 160 F, in the paint shop; 1 detector, set at 225 F, in the furnace room; and 6 detectors, set at 225 F, mounted above the acoustic ceiling in the offices. The higher set-point is used in the furnace room and above the acoustic ceiling to compensate for the higher ambient temperatures in those normally warm areas.

A manual alarm box is also available in the office area.

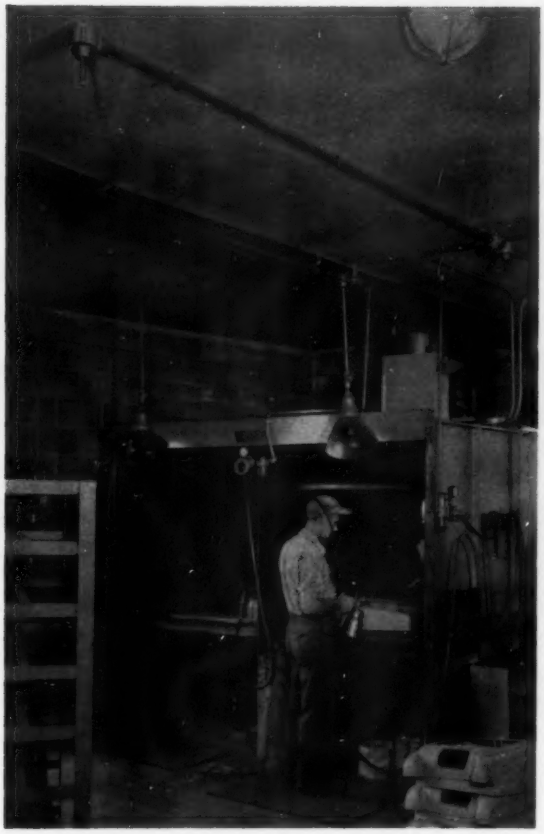
The Detect-A-Fire detectors are hermetically-sealed, impervious to dust and fumes, and can be adapted to explosion-proof housings without modifications.

If a fire breaks out, the nearest fire detector activates the signal circuit and sounds a 6-in. weatherproof alarm bell mounted outside the main building. Simultaneously the alarm signal is received at Potter's monitor room in downtown St. Louis.

In the monitor room the alarm is flashed on the appropriate indication box (each of which handles the input from 25 plants) which produces on a tape the code number designating the affected plant (Fig. 3). The operator immediately moves to a sending box and dials the code number shown on the receiving tape. This automatically places him in direct phone communication with the two municipal fire stations nearest to the affected plant (Fig. 4). Thus trained assistance is dispatched to the scene by a quick, smoothly-working routine.

Generally, the first five minutes of a fire are the critical ones, because the type of action taken during that period can make the difference between a minor fire and major damage. Potter Electric states that the fire apparatus will be on the street within 30 seconds after the alarm is received in the monitor room. This was confirmed when a fire actually occurred at Hunter some months ago. The fan on one of the baking ovens jammed, the drive motor overloaded and caught fire. The fire was picked up by a nearby Fenwal detector (Fig. 2) and, according to witnesses in the plant, the apparatus arrived at the plant within three minutes.

The advantages of a central fire monitoring service are significant. It gives round-the-clock protection, so that apparatus is summoned regardless of whether the plant is operating or not; and response by fire apparatus is automatic, so that a fire can not get out of hand because plant personnel, either because of excitement or poor judgment, failed to summon help in time. Faster response reduces the probability of extensive damage to the plant which could cause not only property damage, but also a large secondary loss due to a production stoppage. Also, because of the better fire protection provided, plant insurance premiums are 20 per cent lower than the normal rates.



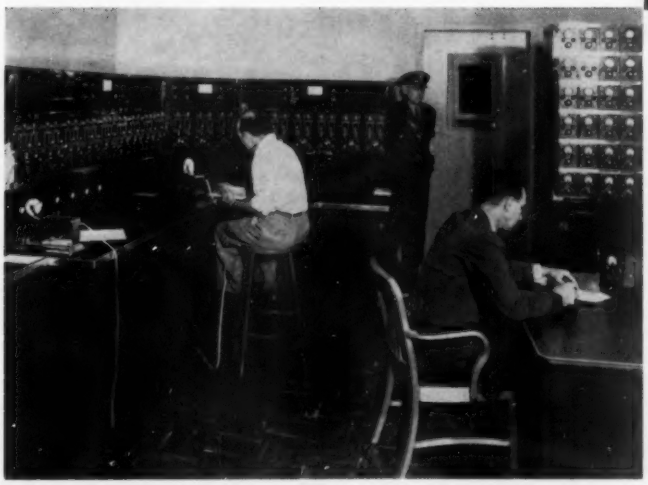
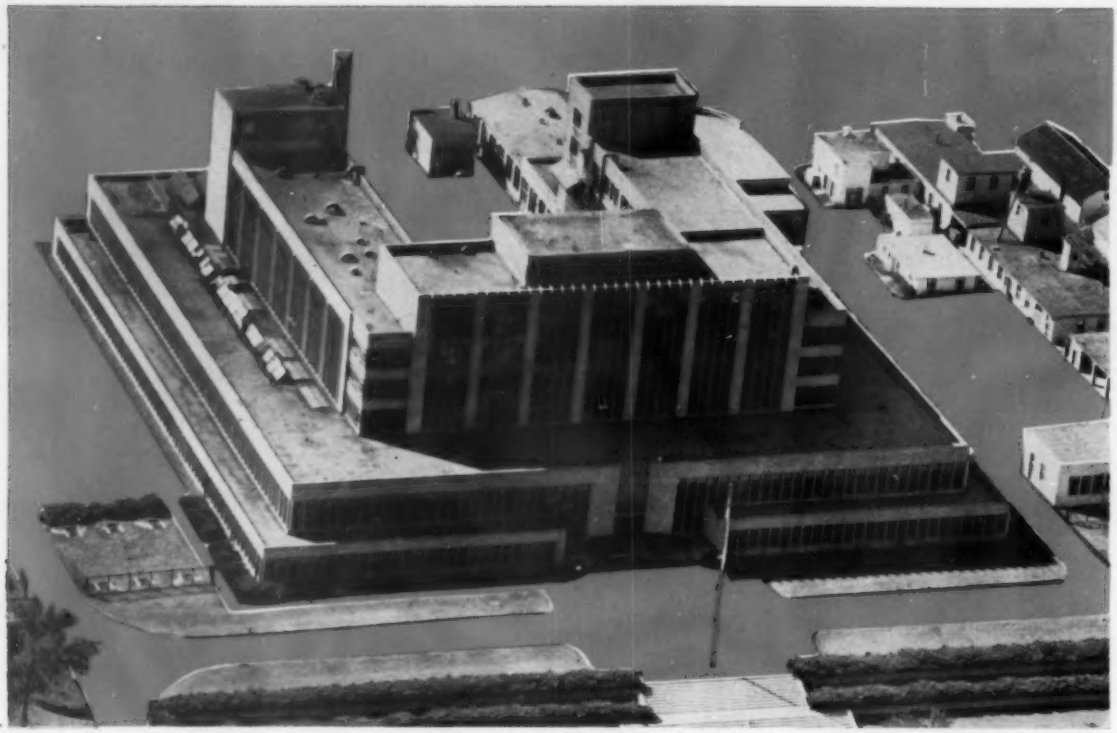


Fig. 1. (Top left) Fire detectors, on ceiling, in explosion-proof fittings protect paint spray department. Fig. 2. (Top right) Horizontal model above the drying oven in the background detected fire in fan motor. Fig. 3. (Lower left) Monitor room at Potter Electric where signals are received on panel at left, then converted to plant code number by tape printers. Fig 4. (Lower right) Code number of plant is dialed, operator is automatically put into contact with fire station nearest scene of alarm



Floors, Walls, Die Models, Acoustical Tiles All Prove . . .

Wood Is What You Make It

By F. J. CHAMPION, Forest Products Laboratory, Forest Service, U.S. Dept. of Agriculture

WOOD IS a versatile and familiar material. Its adaptability and traditional abundance have made it commonplace in hands both skilled and unskilled and subject to sound engineering. In the United States an active research program on the scientific use of wood has been under way for nearly half a century. Since 1910 the center of this work has been the Forest Products Laboratory[1] of the Forest Service, U. S. Department of Agriculture. The main Laboratory and some of its outlying buildings are shown in Fig. 1.

New Uses, New Products

The purpose of the Laboratory is to increase the usefulness of wood, to reduce waste in harvesting, manufacture, and use, and to increase its serviceability in the hands of industrial and other users.

There are a number of new products of wood and wood fiber just coming onto the market or which may be expected to appear on the market as interest develops on the part of wood processors or as it becomes apparent that they meet a particular in industry need.

One of the newer products already available is a paper overlaid veneer which combines some of the virtues of both veneer and thin lumber. The product consists essentially of a sheet of thin inexpensive veneer to which is bonded a sheet of tough, resin-treated paper. This product is being used extensively in building containers for the shipping of fruits and vegetables, taking over a use formerly held by thin box shook.

Promising in the list of still experimental forest products is overlaid lumber (see Fig. 3). In the production of this material a resin-treated tough paper is bonded to low-grade lumber to mask any defects in the lumber and to provide moisture resistance and a superior surface for painting. The paper overlay has demonstrated a substantial restraining effect on the shrinking and swelling of lumber to which it is applied. By edge gluing of random width boards the overlaid material might be produced in a wide range of standard sizes.

It is a potentially superior product, well adapted to cutting and painting, dimensionally quite stable, and based on the considerable quantities of low-grade lumber that are normally marketed with difficulty by the lumber manufacturer. An improved wall siding is a promising possibility.

Modified Woods

A test of overlaid lumber is under way in the University of Wisconsin football stadium. Here a number of badly weathered seat plank have been replaced by paper overlaid plank, which are designed to be check free, have good paint holding characteristics, and offer desirable protection to bolts and other metal attachments.

The future of paper overlaid wood materials is almost unlimited. Already in common use are plywoods with decorative, durable overlays in a wide range of attractive patterns. One of

[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

these is the counter top material with a composite overlay including a decorative gravure underlaid by a thin sheet of metal foil to carry away heat and minimize the damage of the ubiquitous cigarette butt.

In the field of modified and improved woods two of the most notable products are impreg and compreg—both perfected at the Forest Products Laboratory and both having come into industrial use. Impreg is made by impregnating wood veneers with a solution of phenolic resins, drying the veneers, bonding the veneers into a laminate and polymerizing the resin in place.

High Density Wood

Compreg follows the same initial process pattern but in the bonding process the resin-treated wood during the process of polymerization is compressed to a density that may range as high as 1.45. Compreg is moisture resistant, highly stable in dimensions, hard, and susceptible of taking a high through-and-through finish which can be restored by buffing if scratched. Compreg has found use for drilling jigs, shuttles, bobbins, and picker sticks, and for highly durable cutlery handles. It may yet find wider industrial uses when its special properties are recognized.

Impreg is currently enjoying a Cinderella-like romance within the automobile industry. Impreg was "discovered in obscurity" at the Forest Products Laboratory by visiting engineers of the Ford Motor Company, who were concerned with difficulties involved in making body-part die models from natural mahogany laminates. The models, copied in metal on Keller machines, were giving a good deal of expensive recarving trouble because of dimension changes due to moisture variations of the wood in process, sometimes necessitating scrapping of entire models already charged with expensive model makers' labor.

Typical models fabricated from impreg placed in the Forest Products Laboratory's 90 per cent humidity room for several months showed no significant dimensional change and the Ford Company began the changeover from normal mahogany to mahogany impreg, a process involving the setting up of competent impreg fabricators qualified to produce a large volume of the product. Within the near future all Ford body-part die models will be made from mahogany impreg, with current developments likely to lead to the use of impreg from cheaper American woods in a reasonable time.

During the die model development work the Ford Company made exploratory tests of impreg for crankshaft patterns used to make experimental shell-molded crankshafts. In this application advantage is taken both of the dimensional stability and heat-resistant properties of this impreg, inasmuch as the pattern is heated to 400 F before the shell mixture is set and resin is applied. Because of the heat, a heat-resistant glue, such as resorcinol glue, must be used for bonding the laminations for this application. The shells obtained are very satisfactory, even to the extent of reducing the amount of machining needed on castings.

The Forest Products Laboratory has been conducting research that has contributed to the continuing development and use of so-called sandwich materials —a term used to describe sheet or panel materials characterized by a low density core to which are bonded relatively thin faces.

The typical sandwich is extremely light in weight, strong, and likely to have good thermal insulating properties. One of the most successful of the core materials is the paper honeycomb, made of resin-treated paper. The core materials are generally moisture resistant and slow burning. Floor, bearing wall, and partition paneling of well-made honeycomb-core sandwich have adequate strength.

The facings employed offer a wide choice of materials—hardboard, plywood, aluminum, laminated paper plastic, or veneers—or combinations of materials for decorative or protective purposes. It is interesting to note that one commerical sandwich paneling is supplied by an aluminum company—a sandwich having a paper honeycomb core and aluminum faces.

Acoustical Properties

One of the most interesting of the experimental sandwich panels developed at the Forest Products Laboratory is an acoustical ceiling panel made with a paper honeycomb core and faced with what is known as white-pocket Douglas fir. The white-pocket fir has a texture similar to that of pecky cypress—with considerable decorative appeal. (See Fig. 2.) Appropriate tests demonstrated that the panels faced with it have acoustical properties equal to some of the standard acoustical boards. The acoustical sandwich was developed as a demonstration of a potential use for large quantities of the white-pocket material that are available in the Pacific Northwest.

One composite sandwich under development combines the essential virtues of several unlike materials. This material has a paper honeycomb core faced with masonite on which (weather side) is a thin steel sheet carrying a decorative and highly protective ceramic coating. Some commercial sup-

How Forest Products Laboratory Can Help You

The Forest Products Laboratory offers a number of services designed to make the results of Laboratory research, observation, and experience available to industry. Staff members are prepared to answer questions by correspondence regarding design and maintenance of wood structures and problems in the production of commodities made from wood.

The Forest Products Laboratory has available several thousand publications on wood properties and uses that can be obtained free on request.

Properties of wood mentioned briefly in this article, appear in detail in USDA Agriculture Handbook No. 72, "Wood Handbook." First published in 1935, the 528-page new edition of the Handbook is available only from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for $2.

The Laboratory has hundreds of briefer one-subject reports and technical notes available.

Lists of these publications, divided according to principal fields of wood use, are available on request. Subjects covered include boxing and crating; building construction; chemistry of wood; fungus defects of wood; wood preservation; glue, plywood, and veneer; growth, structure, and identification of wood; logging, milling, and utilization of wood; mechanical properties of timber; seasoning of wood; wood finishing; structural sandwich, plastic laminates, and wood-base aircraft components; furniture manufacturing; and pulp and paper. A general mailing list is maintained to provide to interested firms semiannual announcements of new publications.

In cases where such work dovetails with the established objectives of the research program and where a large consumer or industrial group is likely to benefit, the Laboratory engages in cooperative research financially supported by cooperating companies. Occasionally, cooperation takes the form of demonstrations or training seminars for special groups.

Fig. 2. Acoustical ceiling panels of paper honeycomb faced with white-pocket Douglas fir. Properties are equivalent to those of some standard boards

pliers of paper honeycomb deliver the honeycomb in a compact form resembling the structure of the tissue Christmas bell of tradition and bonded in very much the same way. A few inches of the collapsed core can be softened and expanded to as much as 6 feet of length when received by a panel fabricator.

Although most interest in sandwich has been in connection with walls and dividers for aircraft, boats, railway coaches, and similar applications, it should be increasingly available for lightweight office partitioning. It may well be that the exterior walls of the industrial plant of tomorrow will be honeycomb panels. Already there is interest in building sandwiches with considerable inherent strength in the honeycomb itself, thus pointing to a rugged type wall for heavy service.

Over-Concrete Flooring

Several new types of floors, suitable for office service, have been devised and are awaiting commercial development. One of the new floors which has seen service at the Laboratory is a flexible plank-type floor designed essentially to meet a rising demand for an inexpensive wood floor suited to laying on a concrete-slab base. The wearing surface of this floor is ⅛-in. hardwood veneer. The veneer is bonded to ⅝-in. lumber backing, which is provided with deep grooves (at right angles to length) almost through its thickness. The deep grooves give the flooring a flexibility that permits it to accommodate normal irregularities in the floor slab. Grain in the veneer is at right angles to the backing so that dimension changes are restrained and balanced as they are in normal well-made plywood.

In the interest of economy the backing lumber may be low-grade lumber of any wood running not less than 25 pounds to the cubic foot in weight. Knots and checks may be present so long as the backing presents a good bonding surface to the veneer. A floor of this type, laid on mastic in 1951, is standing up well under normal service in an office.

Veneered planks of convenient size for quick installation measure 9 in. by 72 in. The veneers can be grooved to give an appearance of random strip flooring.

Another type of floor, also designed to meet the need for a wood floor and suitable for use on a concrete slab, is an all-veneer strip product. This floor consists essentially of ⅛-in. hardwood rotary-cut veneer dried from the green condition with special cauls under pressure to produce a dimension stabilizing effect. Laid up tight on mastic in widths usually used in flooring, this material, in more than four years' service, has shown every indication of durability so long as a thoroughly good bonding job is done with the mastic. Its freedom from shrinking and swelling during a considerable swing in atmospheric humidity has been outstanding.

Fig. 3. Plank type floor meets need for inexpensive wood floor suitable for laying over concrete-slab base. Flexibility accommodates irregularities in slab

Centrifugal Pump With a Problem . . .

Mechanical Seal Stops Fatty Acid Leakage

By EDWARD M. BENJES, Lever Brothers Co., Baltimore, Md.

IN MANY INSTANCES, the plant engineer can improve operating conditions and reduce costs by applying mechanical seals to centrifugal pumps originally equipped with stuffing boxes.

One centrifugal pump to which the mechanical seal was adapted was chronically troublesome with leakage from the stuffing box. The material handled by the pump was a fatty acid, and some monetary loss occurred, due to the product loss and the attendant cost of cleaning up. Safety was involved, too, in having the fat spilled on walking areas around the pump. The characteristic of the pump was such that the packing would tend to burn if tightened sufficiently to control leakage; and, if left loose enough to prevent burning, the leakage would be more than tolerable.

While the primary idea was to install a mechanical seal to remedy the leakage condition, an inspection of the pump showed a need for repairs to the impeller and the casing head. Earlier difficulties had indicated that the impeller was working loose and wearing away against the casing head. To provide a locking device where the impeller is secured to the shaft, the cap nut was machined into two parts so that a locknut action could be obtained.

An examination of the new arrangement, Fig. 2, shows the elimination of one part, the shaft sleeve. Use of the mechanical seal eliminates the need for this item as shaft wear is virtually zero.

Another feature worthy of note is the void between the end of the new seal and the bottom of the stuffing box. This provides a space where, in the event of mechanical seal failure, temporary use of packing will keep the pump in operation until complete repairs can be made. The seal, in this application, is used as a packing gland. Since the stuffing box is not properly designed for ordinary packing, however, the use of packing should be only a temporary expedient.

Seal Should Be Undersize

The mechanical seal should be slightly smaller in diameter than the shaft as manufactured, if possible. Usually, the shaft will be worn, corroded, or slightly bent at the point where the seal is to be installed, and by adopting a smaller diameter, the shaft can be reused after a simple machining operation; otherwise, a metal spray buildup job is required.

It is necessary to maintain close tolerances on two points, when machining and assembling, to provide satisfactory seal life. First, the runout or eccentricity of the shaft where the seal is located—Point A on Fig. 2; second, holding a 90 deg relationship between the center line of the shaft and the gasket face of the seal.

In remachining the shaft to provide a proper diameter for the seal size, the shaft should be checked for runout at the two points where the bearings fit the shaft. A runout of .001 in. is good, and if above .003 in., corrective steps should be taken. After machining, the runout at Point A should be checked before the shaft is removed from the lathe, and again when the shaft is installed in the pump housing.

The second item, the 90 deg relationship of the shaft and the seal gasket face is established with the remachining of the pump casing as the initial step. After the bushing shown in Fig. 2 was installed in the stuffing box to accommodate the seal, the pump casing was placed in a lathe and set true with the machined surface that fits the pump housing.

A finishing cut was then taken across the face of the bushing at the gasket surface, to make this surface true to the other machined surfaces of the pump casing.

When the pump casing was assembled into the pump housing, a dial indicator was fixed to the shaft and rotated against a machined surface of the pump casing. Close alignment is established by adjusting the casing until the dial indicator zeros out, and then socking home the casing clamping bolts.

Two particular points of caution are important when installing the seal: first, apply a small amount of lubricant to the seal before slipping it on the shaft; second, do not force the seal over sharp edges.

Although the initial conversion cost is relatively high, replacement costs of the seal used (Syntron) are attractive, since the seal can be repaired for one third the cost of a new seal.

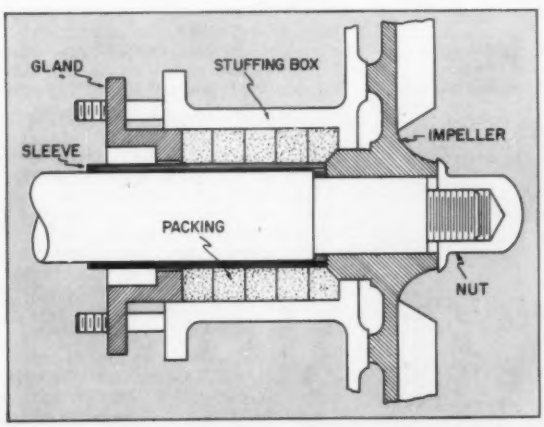


Fig. 1. Cross-section drawing of pump impeller and shaft, before seal was installed, shows typical construction

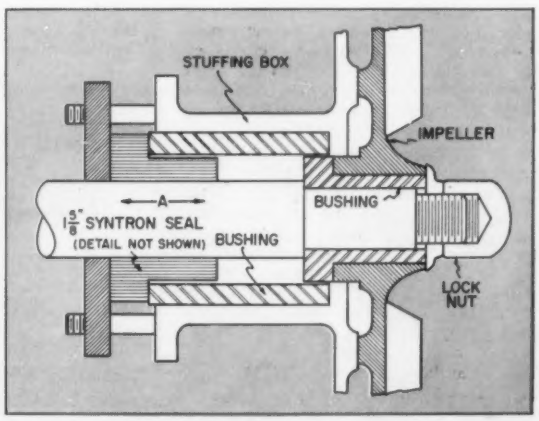


Fig. 2. Pump impeller and shaft, with mechanical seal installed. Cap nut is split for locking action against impeller

Upcoming Series on Fluid Power Maintenance

INSTALLATION AND maintenance play a very important part in the success or failure of a fluid power system. It matters little how well the designer may have laid out the fluid power system or how much the components of this system cost if it is not properly installed or maintained. In this series of twelve articles on "Maintenance of Fluid Power Systems," the authors will attempt to point out many of the things which should help you when installing and maintaining your fluid power system. We feel that the authors' thirty years of experience in designing and servicing fluid power systems will be of benefit to the plant engineer in helping him to do a better job with this type of equipment.

Fluid power as used in this series will cover both hydraulic and pneumatic means of motivation. Seven articles will be devoted to hydraulics, four articles to pneumatics, and the final article is a combination.

Hydraulic articles are as follows:

1. Installation of a Hydraulic System
2. Selection of Proper Fluids
3. Cleaning of a Hydraulic System
4. Maintenance of Hydraulic Valves
5. Maintenance of Hydraulic Cylinders
6. Maintenance of Hydraulic Pumps & Motors
7. Maintenance of Accumulators & Intensifiers

The list of pneumatic articles:

1. Installation of Pneumatic Systems
2. Selection & Maintenance of Filters, Lubricators, Water Traps, and Compressors
3. Maintenance of Air Control Valves
4. Maintenance of Air Cylinders.

Title of the last article will be "Selecting and Maintaining Replacement Parts for Fluid Power Systems."

I. Installation of Hydraulic Systems

By H. L. STEWART, and J. M. MORITZ, Logansport Machine Co., Inc.

SINCE THE hydraulic power device is the heart of the whole hydraulic system, the correct installation of this component is extremely important. Although the selection of the type of power device is usually made by the designer of the circuit, it is up to the installers or maintenance men to place it in the most advantageous location from a functional and maintenance standpoint.

Before going too far into the actual installation of the unit something should be said in regards to the installation of the driving power on the unit, i.e., the electric motor, gasoline motor, or air motor. Often power units are purchased without the driving force as many plants like to make their own selections of motors or may carry a supply of electric motors in stock. In this case it is up to the installers to place the motors on the power units.

Extreme caution should be exercised in order to make certain that the shaft of the motor is in perfect alignment with the shaft of the hydraulic pump, that there is proper clearance between, and that the motor is mounted securely to the mounting plate of the power device. Even though the shafts of the motor and pump are connected by a flexible coupling, unless alignment is maintained the bearings and seals of the pump, the bearings of the motor and parts of the coupling will soon become worn. Excessive seal leakage of the pump is often quickly traced to poor alignment.

The authors have seen installations where new pumps have completely failed in a few days just because the installer did not take the necessary precautions when installing the motor. It is suggested that wherever possible the motor should be installed by the manufacturer of the unit who has the proper tools and gages to do an accurate job.

Power units driven by gasoline engines are rarely used around industrial plants. These are usually installed in mobile equipment or in places where electrical power is not available. Hydraulic units which are driven by air motors can be used advantageously in locations where hazardous fumes are present.

The power device should be placed on a firm foundation located as close to the rest of the circuit as possible so as to eliminate any excess piping and to keep the hydraulic system as compact as possible. There are some exceptions to this however, such as in highly explosive atmospheres or around furnaces.

In these cases it is usually necessary to locate the power units some distance away from the remainder of the system. In powder plants the power units are normally located in a separate room. If solenoid controls are used, they also will probably be placed in the same room with the power unit. Around furnaces the power units are often protected by a wall or baffle in order to reduce the heat condition.

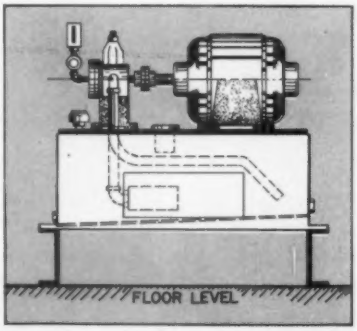


Fig. 1. Method of mounting hydraulic power device above floor for cooling

Even though the power unit should be placed close to the remainder of the hydraulic system, it should be situated so that it is readily available for servicing.

We find so often that units are situated in such a position that it requires a near-acrobat to service them. Cleanout plates on the sides of the units should be readily accessible. There should be enough room over the top of the unit so that the pump, strainer, and motor can be removed if necessary. Remember, on large units the motors and pumps may weigh several hundred pounds and it may be necessary to use hoists in order to remove them.

It is desirable to have the bottom of the power unit mounted several inches above the floor level. First, it allows the air to circulate underneath the reservoir thus creating a larger cooling area; second, oil spilled from the unit can more easily be cleaned up thus eliminating a fire hazard; third, it is easier to drain the unit as the drain port will be up off of the floor; fourth, the unit can be picked up with a fork truck when repairs are necessary. Fig. 1 is a suggested means of locating the unit above the floor level.

The power unit should be mounted

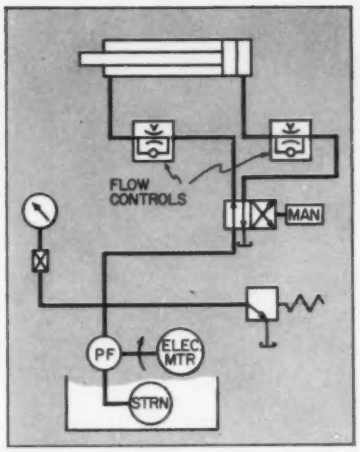


Fig. 2. Circuit designed to show use of control valves for exhaust metering

in the lowest spot in the hydraulic system or at least below the level of the valves in the system. This will reduce back pressure to the valves which often cause them to malfunction. Place the power unit close to the hydraulic system, in a place that is accessible, and if possible, in the lowest spot in the system.

Installation of Control Valves: There are many variables to consider in the installation of control valves. As an example, the master control valve should be located as close to the operating cylinder as possible so as to eliminate long runs of high pressure piping, and to insure a quick response when the valve position is shifted. This is not always possible. For instance, on a rolling mill the master control valves will be located in the pulpit high above the mill while the cylinders which these valves operate may be necessarily several hundred feet away. When manually-operated master control valves are used they must be placed at the operators convenience rather than with efficiency in mind.

When solenoid-operated or pilot-operated valves are used they can be installed close to the cylinders while their operating means can easily be placed for the convenience of the operator.

All master control valves should be securely mounted on a good flat surface. Even though hydraulic valves are extremely rugged, it is possible to cause sufficiently high internal stresses in some valves to bind the piston and make the valve malfunction. Remember the fit between the body and the piston is only a few ten-thousandths of an inch.

Flow control valves are often improperly installed in the system. Most simple flow control valves meter the oil as it flows from the cylinder. This is known as exhaust metering. There are some valves, however, that use the intake metering principle. Figure 2 shows a circuit making use of a flow control valve of the exhaust metering type. Note this valve has a built-in check valve for free-flow return action.

Solenoid-operated valves should be installed so as to give the solenoid the best possible action. Make certain that the voltage applied to such valves corresponds to the voltage marked on the coils.

Valves having plugs marked "connect to drain" are often a source of trouble because this bit of instructions may go unheeded. This will cause a valve to malfunction quicker than anything else. Make sure that all drains are open.

After the valves have been installed make certain that those with any external moving parts are protected during the erection period from paint spray, water, and weld spatter. Any foreign matter accumulating on the highly polished valve stems which move into the packings will damage the packings and cause leaks. It's difficult to imagine the number of service calls made by the valve manufacturers because precautionary measures are not taken during installation.

Wherever possible keep the hydraulic controls away from intense heat. Intense heat not only increases the temperature of the oil in the hydraulic system but it has a detrimental effect on the packings in the valve. Even high temperature packings are only suitable up to 500 F. If it is absolutely necessary to mount the valves in "hot spots" some baffle or protection should be afforded the valves from hot blasts.

Installation of Hydraulic Cylinders: Careful installation of hydraulic cylinders is of paramount importance. You are dealing with a component that is capable of delivering a tremendous force. Before any cylinder is installed it should be thoroughly inspected. It is usually easier to service a cylinder before it is installed than afterwards.

A number of things can happen to a cylinder if it is stored before installation especially if the cylinder is shipped into a plant which is under construction. The authors recall one instance where several large cylinders were shipped into a plant that was

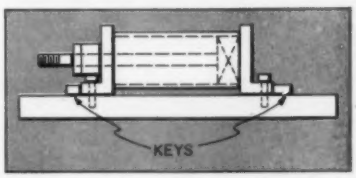


Fig. 3. Method for mounting hydraulic cylinders using keys to absorb thrust

under construction. When the installers started to rough-in the hydraulic system they evidently needed some pipe plugs so they removed some of the pipe plugs from the cylinders.

This left the interior of the cylinders exposed to the elements. The cylinders were then installed, quite likely without any inspection, and after the system was in operation for a very short time the cylinders failed. Upon dismantling of the cylinders, one cylinder was found to have steel shavings imbedded in the piston which evidently was caused by a drilling operation overhead while the cylinders were lying around in storage with the ports exposed. Another cylinder had welding splatter imbedded into the piston. Still another had a quantity of sand in it. All this was caused because the pipe plugs were removed from the cylinders while they were in storage. This case may seem a bit unusual but much damage can be done to preci-

A Little Bit About the Authors

H. L. Stewart, a product of Purdue University, spent a number of years in the design engineering field before joining the engineering staff of his company in 1942. He started here as a design engineer and was, a short time later made Director of Research; later he was put in charge of all special engineering. He has spent much of his time in the field working on fluid power problems and giving instruction on their proper maintenance. He has written numerous magazine articles, lectured before technical societies and has had an excellent book published on his specialty—fluid power systems.

H. L. Stewart

J. M. Moritz started out with his company in 1942 as a specialist in the development of power-operated holding devices. He pioneered in the development of power-operated shell holding devices during the last war. Later, as Chief Draftsman of the special department of engineering, he spent considerable time in the field on service engineering and project development. He thoroughly understands the problems which arise in the application of fluid power to present-day machines and processes. He has seen, many times, what happens to improperly maintained fluid power systems.

J. M. Moritz

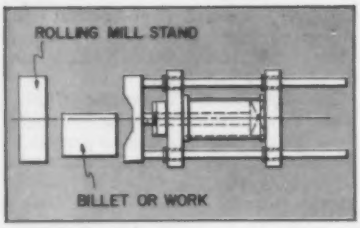


Fig. 4. Coping with eccentric loading

sion-built cylinders before they are ever installed.

One common trouble that is encountered is that cylinders are often stored in damp places or even out in the weather for long periods before they are installed. Any accumulation of rust on the rods will have a detrimental effect on the packing and leakage will soon occur. If cylinders are

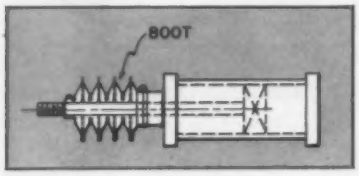


Fig. 5. Boot for protecting piston rod

to be stored for any length of time protective measures should be taken.

Storing cylinders in extremely hot places will have a detrimental effect on the packings and gaskets and the cylinders will leak after they are installed.

Now, to get down to the actual installation. Since hydraulic cylinders can impart such power, they must be securely mounted. It is advisable to key foot or centerline mounted cylinders as shown in Fig. 3. Even though the mounting bolts are securely tightened the keys will take care of the extreme thrust. Mounting plate should be flat so that there will be no distortion in the covers when the mounting bolts are tightened.

Whatever type mounting is used, the mounting plate should be more than ample to take the thrust. Long strike cylinders mounted in a horizontal plane should have a support on the end of the piston rod. If a large rod is allowed to be extended without support it will cause undue wear on the rod bearing and also excessive side wear on the packings. When rod supports are used, they should be constructed in such a way to eliminate any binding of rod with the rod bearing. If large eccentric loads are encountered heavy rod guides should be used. See Fig. 4.

Piston rods should be protected wherever there is an excessive amount of foreign matter present such as grinding dust, water, paint spray, etc. Rods may be protected by collapsible boots of canvas or synthetic material, by guards, or by rod scrapers or wipers. Figure 5 illustrates the use of a collapsible boot. One end of the boot is to be fastened to the packing gland and the other end to the end of the piston rod extension.

Piston rods should also be protected from falling objects as dents in the rod will cause packing trouble resulting in leakage.

Installation of Heat Exchangers or Heaters: In the majority of hydraulic installations heat exchangers or heaters are not required but in certain cases either one may become an important factor in the operation of a hydraulic system.

Use of a heat exchanger is usually advisable on installations where the oil temperature exceeds 150 F. Oil at higher heat levels shortens the life of packings and also causes more oil leaks as the viscosity is lowered. The question often arises as to "where is the best place to connect the heat exchanger into the system". Heat is usually created two ways in a hydraulic system. One, when large volumes of high pressure oil is spilled through the relief valve for a long period of time and the other being when the hydraulic system is subjected to extremely high external temperatures.

Heat exchanger should be mounted on a solid base. In order to keep the installation compact, they are often mounted on the side or top of the oil reservoir of the power device. Shown in Fig. 6 is a typical installation.

When connecting the heat exchanger to the hydraulic system, if the heat is caused from the oil spilling through the relief valve at high temperatures, the inlet oil connection in the exchanger should be connected to the exhaust of the relief valve and the exhaust connection of the exchanger should be connected to the return line of the oil reservoir. This cools the oil before it enters the reservoir and keeps the oil that is being pumped into the system at a suitable operating temperature.

When the heat in the system is caused by external temperatures then the heat exchanger should be placed in the return line to the oil reservoir thus cooling the oil as it is returned to the reservoir.

One common mistake is to place the heat exchanger in the oil return line when the heat is caused by the oil spilling through the relief valve. This allows the high temperature oil to be pumped through the system thus causing packing troubles and leaks.

In making the connections to the heat exchanger the oil is usually piped to the shell side and the water to the tube side. This is done because the shell side of the heat exchanger is baffled thus the shell fluid is required to make a number of changes in its direction on its travel through the exchanger. This helps break up the film that tends to form which prevents the heat transfer.

Heat exchangers are of two types, the single pass type, and the double pass type. Both are shown in Fig. 7. The single pass type should be piped counter flow for greatest heat transfer. This will allow for the greatest mean temperature difference over the full length of the exchanger. The two pass exchanger should be connected so that the oil enters the exchanger at the same end at which the water enters and leaves. The water flow may be controlled by valving so that when the oil temperature is satisfactorily reduced, the water flow through the exchanger will be automatically stopped.

Immersion type heaters are often

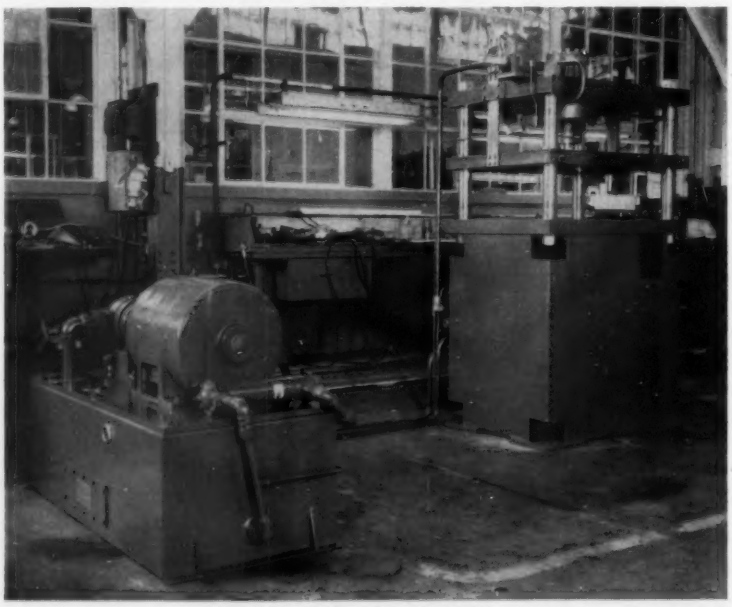


Fig. 6. Heat exchanger mounted on power device to give it a firm mounting base

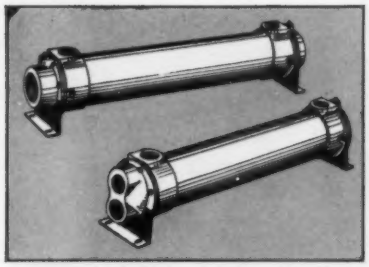


Fig. 7. Single and double pass heat exchangers. Piping details for these two heat exchangers differ materially

required during the winter where the system is located out of doors. The heater should be located in the oil reservoir and thermostatically controlled. By keeping the oil temperature at an even level the components will perform much more satisfactorily. Seldom is it necessary to use both heaters and heat exchangers in the same system.

Installation of Piping and Fittings: After the components of the hydraulic system have been installed in their proper location it is then time to install the piping. In hydraulic systems several classifications of piping may be used—rigid, semi-rigid, and flexible. Rigid type is pipe which in high pressure hydraulic systems is specified as extra heavy. Semi-rigid type is tubing of steel (annealed) or aluminum (used very seldom on industrial applications). Flexible type is hose (reinforced with cloth braid or wire braid).

Use of steel tubing for "piping-up" a hydraulic system is becoming more and more popular because of its ease of installation. It also eliminates many fittings since it can easily be bent to meet almost any requirement. In order to make the bends, tube benders should be used to keep the tubing from collapsing. Tube benders also assure smooth even bends. The radius of these tube bends should be approximately three times the tube diameter.

There are a number of different types of fittings used with hydraulic tubing—compression type, flare type, flareless type with "0" ring, etc. Each has its merits.

Whether pipe or tubing is to be used, it must be clean. Don't take an old piece of rusty pipe that has been lying around in the maintenance department and use it in a hydraulic system. It has been done and the trouble it causes is disastrous. Think what a quantity of pipe scale or rust will do to precision parts of pumps, valves, and cylinders. Any burrs, shavings from pipe threads, or other foreign matter left in the tubing or pipe will have a detrimental effect on the hydraulic system. Too much stress cannot be placed on the importance of installing clean pipe or tubing.

When installing tubing or pipe there are several rules to follow.

1. Pressure lines should be of sufficient size to carry the oil at a flow rate not to exceed 15 fps. The pipe or tubing size should correspond to the port sizes in the components of the system.
2. Exhaust lines must not be restricted. Many valve malfunctions are caused because exhaust lines are carrying too much back pressure.
3. Hydraulic lines should be as short as possible. Make a neat piping layout. Don't string piping all over the machine.
4. Keep bends or right angle turns to a minimum. They cause friction.
5. Don't be afraid to use some force when tightening piping or fittings. Remember you are working with high pressure and vibration, and you're headed for leaks if you don't make the joints as tight as possible. There have been cases where it was necessary, due to vibration, to weld many of the joints in a hydraulic system to stop leaks.

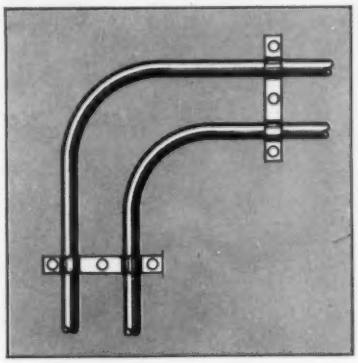


Fig. 8. Method of solid anchoring for hydraulic lines to offset the "straightening" effect of high velocity oil

6. Hydraulic lines should be properly anchored. When high velocity oil moves around a bend it has a tendency to straighten out the bend. By using brackets to secure the lines they will keep the lines from "whipping". Figure 8 shows how piping may be anchored.

Even though the hydraulic lines are usually the least expensive part of the system they are extremely important in the functioning of the system. Install clean lines!

Testing of the Hydraulic System: Now, that the hydraulic system is completely installed it should be tested before it is placed in production. Here are the suggested steps to be taken.

1. Set the relief valve at the lowest pressure setting possible. Start the electric motor on the power unit and check to see if the pump shaft is rotating in the right direction. There will be an arrow somewhere on the pump showing the correct direction of rotation. If the pump shaft is turning in the wrong direction switch the leads on the electric motor.
2. Open the air bleeders in the system. This will allow the air to bleed from the circuit as it fills with hydraulic fluid.
3. Increase the pressure setting on the relief valve so that there is enough pressure to cause the pistons of the cylinders to move when the control valves are shifted.
4. Start through the cycle at very low pressure and determine if all controls are functioning properly, if piston movements are of the correct lengths, and if there are proper clearances in fixtures, etc.
5. If the circuit functions satisfactorily at low pressures and all the air is bled from the system, shut the air bleeders and start bringing up the pressure to full operating pressure.
6. Make any required adjustment on flow control valves, reducing valves, and sequence valves.
7. Take the system through its cycle at normal operating pressure, checking carefully for any leaks in the piping, around piston rods or covers of cylinders and around valve stems. If leakage should occur be sure that it is eliminated before the system is placed in production.
8. On all control valves where there are adjustments make sure that all adjustments are locked before turning the machine over to the operator. Many machines are damaged and many hydraulic circuits are fouled-up because an operator tries to make adjustments on valves.

When installing electrical push buttons, limit switches and other auxiliary equipment to operate solenoid control valves, according to J. I. C. standards the voltage is to be 110 volts. See J. I. C. Electrical Standards for Industrial Equipment.

Guide to Symbols Used in Article

For assistance in following the diagrams which will be used throughout this series, readers may wish to have a copy of the Joint Industrial Council's Hydraulic and Pneumatic symbols for industrial applications. If you would like to have a copy just send a note to the Editor, PLANT ENGINEERING, 110 South Dearborn St., Chicago 3, Illinois, or indicate "J.I.C. Symbols" on the postage-paid card in this issue.

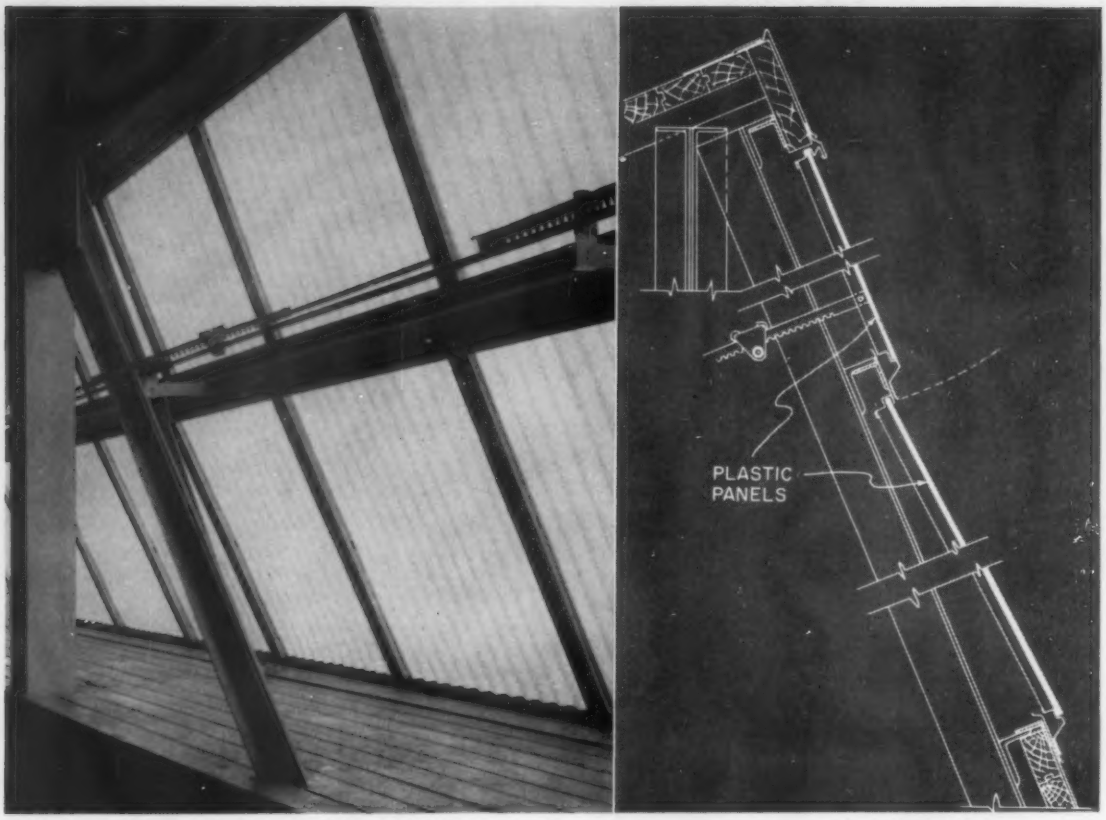


Fig. 1. Close-up view of inside of new skylight is shown at left; at right, section through the skylight shown in detail

Old Plant Gets New Life, Improved Lighting and Appearance

Plastic Skylights Do the Trick

By A. F. NEEB, Building Construction Engineering Manager, Hotpoint Company, Chicago, Ill.

WHEN it became impossible to repair leaks in the standard glass and frames of the skylights in our Home Laundry plant, built in 1919, we made comparative studies of the cost of rebuilding the plant and replacing only the skylights. Of course, other reasons than the impossibility of repair prompted this investigation. The steel frames of the skylights were rusted and warped; very little natural light passed through the glazing because of the number of repairs that had already been made; it was difficult to keep the building at the correct temperature due to drafts caused by poor fit of the skylight frames; appearance was not up to our standards; and it was impossible to open many of the old skylights to provide ventilation. Their general condition also presented a safety hazard if an attempt were made to open them.

As a result of our studies, we believed that by replacing the skylights, enough improvement in the appearance of the plant would result to warrant its continued use for manufacturing and assembly operations.

Panels Tested for Two Years

Since we had found that excessive cracking in the old skylights was caused by the weight of the glazing, we gave careful consideration to the materials suitable for the job and chose plastic panels reinforced with glass fibers, set in aluminum frames.

We ran tests for almost two years on these panels, installed in the old skylights and found no signs of deterioration. Also, it appeared to remain clean for a longer period than previously. Based on these tests, we felt that maintenance and replacement costs on the installation should be very low.

Before specifying materials to be used in the installation, we investigated several types and grades of these plastic panels.

Price of the panels, of course, varied with quality and quantity. We finally selected a material with 2½-in. corrugations, weighing 9 oz per sq ft with 2 oz glass fiber matting, in a pale bluish-green shade.

The complete job consisted of replacing the skylights in a building covering 123,000 sq ft. This required 19,000 sq ft of plastic set into 16-gage aluminum frames.

In order to make the installation as

simple and speedy as possible, the aluminum frames were standardized in 40-ft sections and the parts prefabricated in the sheet metal shop, then assembled on the job site. The plastic cut to size at the plant, was then installed in the frames and neoprene gaskets which followed the contour of the plastic were fitted at top and bottom of the frames. The plastic sheets were cemented and held in place with brass thumb screws.

No Interruption of Work

In carrying out the construction work, sections of the old skylight, approximately 50 ft long, were removed and tarpaulins slung underneath. As the frames were installed the tarpaulins were removed and hung under another section. Where it was necessary to carry on construction over assembly lines involving considerable personnel and finished products, the work was done during lunch periods and week ends. All the work was carried on without any interruption of the production.

The installation changed the entire appearance of the building from dark and dingy to light and pleasant. The lighting level was raised an estimated 10 to 12 foot-candles on a normal day. Working conditions were improved by the ease of ventilation.

We have estimated that we spent $400 per year on outside maintenance of the old skylights. The cost of painting the inside of them was $1,400. Figuring that painting was done every five years this means $280 per year will be saved since the new frames are aluminum.

Offices Get Treatment, Too

In addition to the skylights, we have several installations of luminous plastic ceilings in offices which have given satisfactory results. On remodeling work we found it cheaper to install this type of ceiling rather than a drop ceiling because we did not have to install additional sprinklers. In some offices located in an older building, plastic, similar to that used in the skylights in the Home Laundry plant, was placed over the windows. By covering the old and unattractive frames the overall appearance was greatly improved.

We also had one installation of a luminous ceiling in a building lobby and found that with negative pressure within the building, the ceiling would lift on a windy day, and was eventually damaged. We have replaced this luminous ceiling with standard 1¼ in. corrugated glass fiber reinforced sheet of a milky white color with a non-rippled finish. We are well satisfied with this installation.

Fig. 2. Blue-green plastic skylights provide better lighting than previously, the lighting level having been raised an estimated 10 to 12 ft on a normal day. Both appearance and working conditions have been improved inside plant

Fig. 3. Outside view from plant roof shows aluminum frames and neat appearance of skylights, which were installed in prefabricated, standardized, 40-ft sections

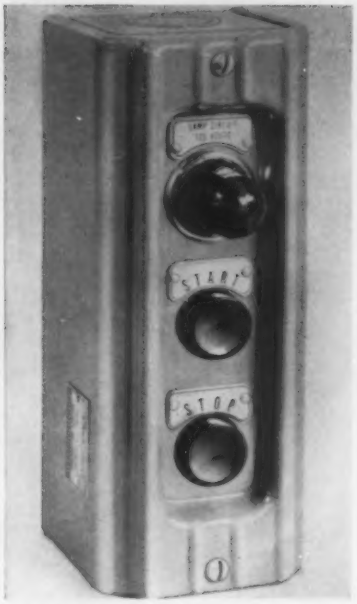


Fig. 1. A typical heavy duty pushbutton station with an indicating lamp

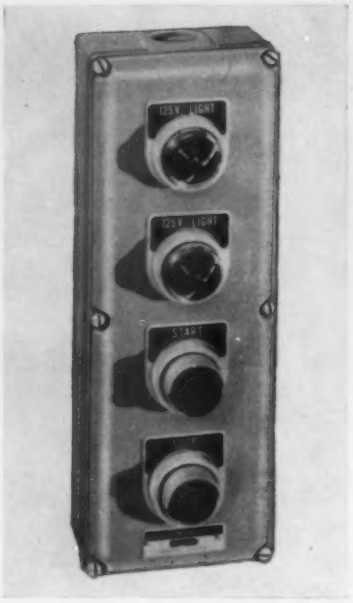


Fig. 2. An oil-tight pushbutton designed to exclude all contaminating liquids

Fig. 3. This oil-tight operator combines selector switch and pushbutton in unit

Industrial Pushbuttons—

Proper Selection of These Ordinary Gadgets Important

By A. E. SCHUELER, Standard Control Div., Westinghouse Electric Corp.

OURS HAS BEEN called a pushbutton age, and rightly so. The necessity for controlling large amounts of power by means of simple pilot devices has made the pushbutton a fitting symbol of our machine civilization.

While the basic function of any pushbutton is simply to make or break one or more control circuits, the many and varied applications in which pushbuttons are used have led to the development of a large variety of units and stations, each of which is designed to meet a particular need or field of application. As a result of this large variety, the prospective user is likely to become confused, and well he might. There are many factors to influence the choice in any given application, such as primary function, type of enclosure, rating of unit, price, and appearance. Nevertheless, pushbuttons can be classified into certain specific categories.

First of all, there are four basic categories into which most pushbuttons on the market today can be grouped. These are: standard duty, heavy duty, oil-tight, special service.

Each one of these categories has certain applications characteristics that are definite and definable with the exception of the "special service" classification. It is a conglomerate of special pushbuttons designed for special applications or industries.

As its name implies, the standard duty line of buttons is designed primarily for use in control circuits of magnetic contactors up to and including NEMA size 4, both a-c and d-c. For example, the great majority of simple motor starting applications, both reversing and nonreversing, found on individual industrial drives, such as pumps, fans, or conveyors represent typical applications for the standard duty button. The chief function in these applications is to start, stop, or reverse a single motor.

While the typical surface-mounted NEMA I enclosure is suited to the majority of such applications, these buttons are usually available also in flush-mounted units, or in water and dust-tight cases, such as would be required for outdoor service.

These general purpose buttons are as simple and compact as possible consistent with providing sufficient space for installation and wiring. Very often, a rotary selector switch provides for maintained contact duty, when required, as well as for typical selector switch applications, such as a three-position hand-off-auto switch.

Heavy duty class of pushbuttons, Fig. 1, is recommended for severe heavy duty service, where frequent operation, rough treatment, or relatively high currents in control circuits are likely. Most manufacturers provide for greater versatility in their lines of heavy duty units and stations compared with standard duty designs. For example, such special types of enclosures as explosion proof or pendant type stations are usually manufactured only in the heavy duty rating. In general, the same applies to such features as mushroom heads and cylinder locks and 3 or 4-point contact arrangements.

Steel mills, printing press drives and crane controls are just a few of the applications where heavy duty pushbuttons are commonly used.

The oil-tight category of pushbuttons is a direct outgrowth of automation in the machine tool industry, particularly in the automotive field. The oil-tight pushbutton, Fig. 2, is designed to effectively exclude oil, coolant, cutting compounds, and similar liquids and yet provide a flexibility of components necessary to perform the wide variety of functions required for this field of application.

In most of the oil-tight pushbutton designs found on the market today this flexibility of components is reflected in the construction of the typical station from three principal elements: (1) the operating head; (2) the contact block; and (3) the enclosure.

The operator, which may be either a pushbutton or rotary switch, owes

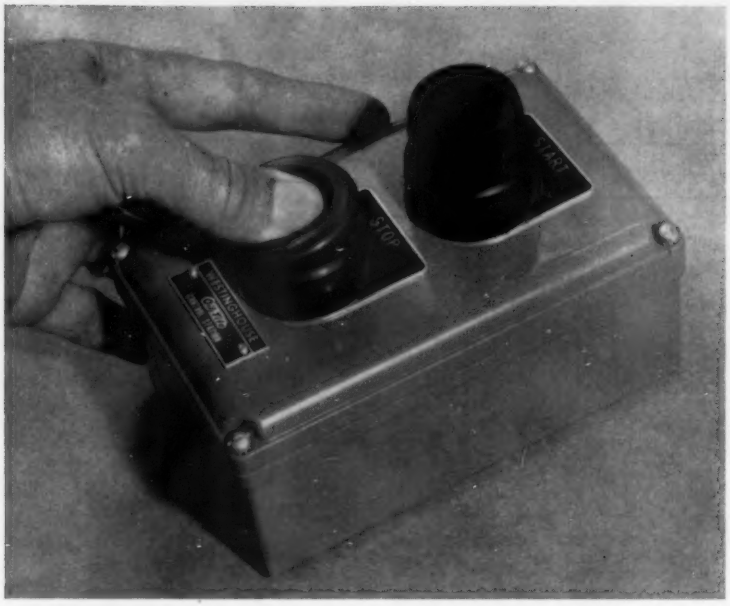


Fig. 4. An oil-tight pushbutton with neoprene caps to keep out dust and sleet permits operation of these units out-of-doors even under adverse conditions

its oiltightness to a close fitting shaft and some type of sealing ring, washer, or diaphragm to provide the necessary seal against the entrance of oil or other liquids.

Contact block is usually available in either single or double-pole models, each pole comprising a set of upper and lower contacts. If an enclosure is used, it consists of a suitably gasketed housing for the particular unit such that the operators, when assembled in the cover, engage the contact blocks to perform the required functions.

Like the heavy-duty pushbuttons, most lines of oil-tight pushbuttons include a variety of accessory items, such as pilot lights, rotary latch, mushroom head units, potentiometers, and cylinder locks. To illustrate some of the special applications for such buttons, let us consider the oil-tight operator which combines the functions of a selector switch and a pushbutton in a single unit, Fig. 3, called "Select-O-Push" by one manufacturer.

It should be understood that on practically all selector switch operators, the method of depressing the moving contact plungers is through a cam attached to the operator shaft which translates the rotary motion of the external switch handle into the linear motion of the contact block plungers. In the special case of this operator, a double-pole contact block is used and the operator shaft can be depressed as well as rotated when the cam is in certain positions.

To illustrate the operation of this pushbutton, let us suppose that we have such an operator attached to a standard double-pole contact block. Several contact positions are obtainable with such a combination. The button can be either depressed or released and the arrow can be turned to either the left or right position.

This arrangement illustrates the versatility required of oil-tight units. For example, when used in an "inch-run" circuit the unit can leave either side of the contact block inoperative while the other side is cammed to its mid-position. Inching is provided by making the left side of the contact block inoperative so that when the button is pressed the left side remains unaffected and the right side bridges the lower contacts, performing the function of an inching or jogging button. In the "run" position, the action is reversed. The right side is inoperative while the left side bridges the lower contacts when depressed, thereby establishing a "run" circuit.

In addition to the operator described above, a full stroke operator is sometimes used. This device also has two positions and combines in a single device the functions of two separate make and break units, either of which can be selected by turning the switch to the desired position. Because the position of the switch provides an indication of the last operation performed, this device has been appropriately described as "the pushbutton with a memory."

By adding a center position to this same operator, a means is provided for breaking both of the normally closed circuits simultaneously, thus combining three functions in a single pushbutton unit.

Although the oil-tight pushbutton is

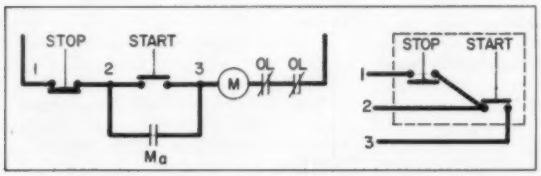


Fig. 5. Shown here is a typical low voltage protection circuit

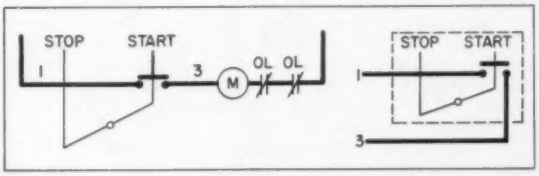


Fig. 6. This is a low voltage release pushbutton circuit

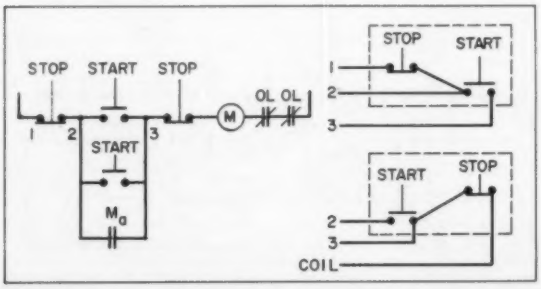


Fig. 7. This is a pushbutton circuit for two-station operation

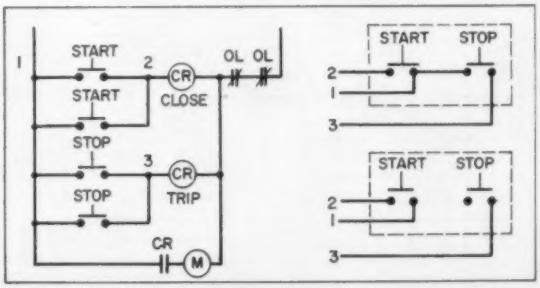


Fig. 8. This circuit is for control by means of two stations

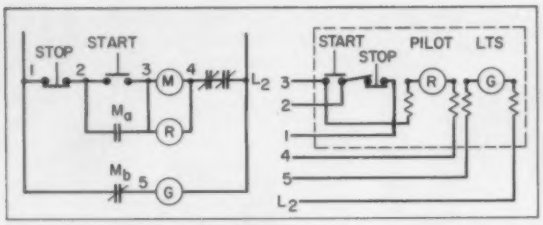


Fig. 9. Circuit with a pilot light to tell motor's condition

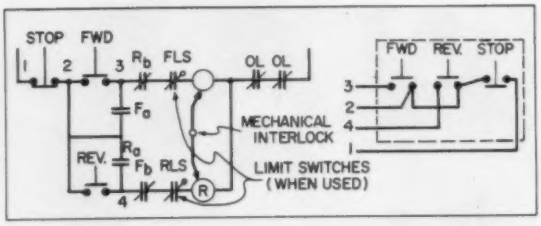


Fig. 10. This diagram shows scheme for a reversing starter

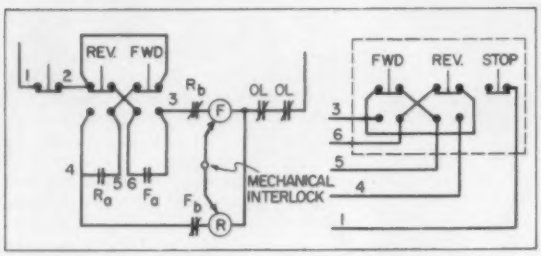


Fig. 11. Pushbutton circuit for reversing starter with buttons cross-connected to give a more positive interlock

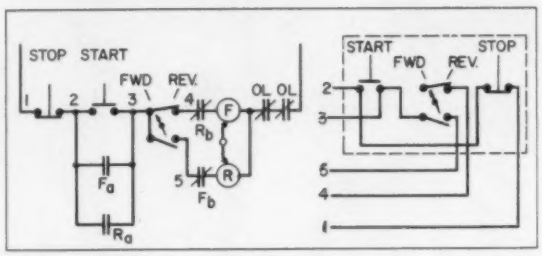


Fig. 12. Two-position selector switch in reversing starter circuit designed to preselect proper direction of rotation

normally applied on machine tool applications to exclude oil and coolant, it is sometimes necessary to make the button dust-proof and weather-resistant also. This is done by the addition of a flexible neoprene "cap" to the front of the button, Fig. 4, held in place by means of a special clamping ring. This permits operation of these pushbutton stations out-of-doors, even under conditions of driving rain or sleet. By the use of tinted neoprene, a number of different color combinations can be obtained.

Just as some motors and controllers are designed for a particular industry or to meet a special need, so are there special types of pushbuttons, differing mainly in the design of their enclosures.

One of these groups of special pushbuttons is the one used on board naval vessels. These devices must withstand not only severe atmospheric conditions, but the high shock of battle service. Because of the corrosive action of salt spray, these watertight, gasketed enclosures are sometimes molded from phenolic material.

In addition to eliminating the corrosion problem completely, these enclosures also have high dielectric strength, making any breakdown in the interior of the enclosure virtually impossible. So successful have been these molded enclosures, particularly in resistance to corrosion, that many of these marine stations, equipped with commercial type pushbutton units, have found their way into industrial plants, paper mills and chemical plants where conventional types of station enclosures have suffered heavily from corrosion.

Still another type of special service pushbutton station is that designed for the U. S. Bureau of Mines for use in gaseous atmospheres. These are necessarily explosion proof in construction and applies to the two-button station only, not to the other two. Their cases are of heavy cast steel, with wide, accurately machined sealing flanges and an approved packing gland. No gasket is permitted between cover and case since gasket would be subject to damage or possible deterioration.

These pushbutton stations must pass tests of the U. S. Bureau of Mines conducted at one of their experiment stations. In these tests a pushbutton is placed in a gallery containing an explosive mixture of gas and air. The mixture is also piped into the pushbutton station and ignited by means of a spark plug screwed into the pushbutton case. The enclosure must withstand a specified number of "shots" without igniting the explosive mixture filling the gallery. For some tests, the gas mixture is augmented by coal dust blown into the case before the test to simulate as nearly as possible conditions in actual service.

Another special type of pushbutton, designed for switchboard mounting, uses a plunger which carries a series of moving contacts separated by insulating spacers. These contacts provide either make or break contacts with an equal number of sets of stationary contacts when the plunger is depressed. By means of an ingeniously interlocked second plunger, this button can also be made to serve as a maintained contact device. This pushbutton has an insulating molded base which carries the stationary contacts and serves as a guide for the moving parts. The stationary contacts may be reversed to provide either make or break contacts as desired.

In addition to classification by the type of enclosure, pushbuttons should be distinguished by a number of smaller but nevertheless important points. These points are not so much a classification of pushbuttons as a guide to selection. They are:

1. Shrouded Buttons—To avoid accidental operation, it is considered good practice to shroud the operating

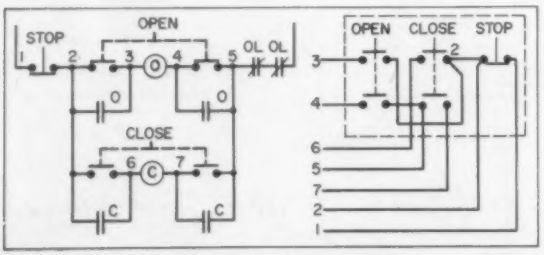


Fig. 13. Valve control circuit that uses a 4-point pushbutton

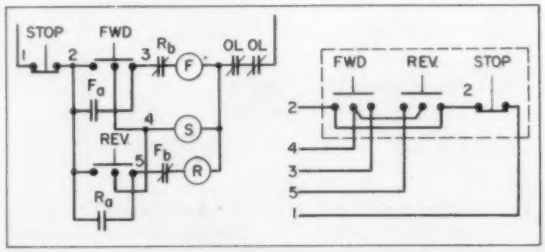


Fig. 14. A typical circuit for a three-point pushbutton

buttons, particularly those which are used to start the motor. This shroud may consist of a ferrule spun into the cover surrounding the button, or merely a portion of the cover raised to produce the same result.

2. Size of Buttons—The buttons themselves should be of sufficient size to make for easy operation, even with gloved fingers.

3. Contacts—Silver has proved to be a desirable contact material, largely because of its low resistance and particularly because silver oxide is almost as good a conductor as silver itself. Double break contacts are, of course, to be preferred over single break, other things being equal. A margin of "overtravel" is desirable to compensate for burning and wearing away of the contacts in service.

4. Wiring Space—Adequate wiring space and accessibility for wiring are points to be considered, since ease of wiring reduces installation costs.

5. Appearance—Finally, but nevertheless of ever increasing importance, is a pleasing appearance, in keeping with the trend toward streamlining of all industrial apparatus.

Of course, the most important selection factors so far as the user is concerned are those that pertain directly to his application. These factors are naturally going to vary for each application. A brief description of some of the more basic schemes used in control circuits will serve to illustrate some of them.

Low voltage *protection* circuit is perhaps the most basic pushbutton circuit. It provides safety for both the operator and the process by eliminating the possibility of automatic restarting of the motor upon restoration of voltage following an outage. The circuit, Fig. 5, uses two momentary spring return buttons connected in series. This is often referred to as "three wire control" and is the scheme commonly used for most machine tool control applications and other industrial drives. This scheme requires the use of a holding interlock (Ma) on the starter to bridge the "start" button.

A common comparison circuit, providing low voltage *release*, permits automatic restarting of the motor when voltage is restored after an outage. This scheme, Fig. 6, uses a maintained contact pushbutton and is commonly used when automatic operation is controlled by a pilot device, such as a float switch or a thermostat for pump, blower, or compressor drives where sudden and unexpected restarting will not endanger the operator or the machine. No holding interlock is required with this two-wire scheme.

Another common circuit is that for multi-station operation. When a starter is to be operated from two or more 3-wire stations, two basic rules apply: 1. Connect all "stop" buttons in series with the starter coil, with each other, and with the holding interlock. 2. Connect all "start" buttons in parallel with each other and holding interlock.

When only two stations are required, Fig. 7, the number of wires between each station and the starter can be kept to a minimum of three wires. Should the starter have to be controlled from two or more stations for low voltage release applications, a latched-in control relay (CR) is commonly used, Fig. 8. In this case both "start" and "stop" buttons are normally open.

Often an indication is desired for "motor running" and "motor stopped" conditions. Here a pushbutton with red and green pilot lights may be used, Fig. 9, by the addition of an extra normally closed electrical interlock to the starter, to energize the green light.

Pushbutton circuits for reversing starters must prevent simultaneous closing of controls. One of the simplest schemes is shown in Fig. 10. This scheme makes use of electrical interlocking between the two contactors in addition to the usual mechanical interlock. Where a still more foolproof interlocking scheme is desired on a reversing controller, the buttons themselves may also be cross-connected, Fig. 11. In reversing starters, a two-position selector switch is also sometimes used to preselect the direction of rotation, Fig. 12.

Three and four-point pushbuttons are sometimes required to perform certain special functions. An example of a four-point button application is in a valve control circuit, Fig. 13, where it is desired to interrupt the circuit on both sides of the starter coil at the same time. A typical three-point pushbutton application would accomplish a circuit condition which could not otherwise be accomplished without the use of relays. Suppose that it was desired to close a starting contactor, S, to bypass the overload relay elements during starting, Fig. 14, but to reinsert them for running when the start button is released.

There are several inching, or jogging, pushbutton schemes in common use, in addition to the inching scheme described earlier in connection with the oil-tight Select-O-Push unit. The simplest of these, from the standpoint of equipment required, involves a means of latching down the "stop" button wired into the holding circuit, Fig. 15, so that the "start" button will serve as an inch button when the "stop" button is latched down. The chief disadvantage to this scheme is that it requires the operator to perform the extra function of latching down the "stop" button before inching. In addition, he must make sure that he does not try to inch with the "stop" button

(Continued on page 214)

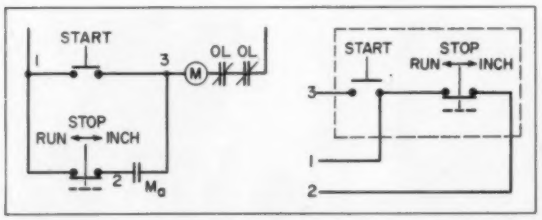


Fig. 15. Inching circuit with latched-down "stop" button

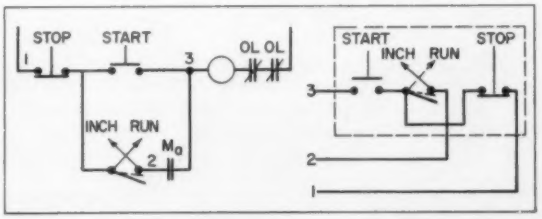


Fig. 16. This, too, is an inching circuit with a selector switch

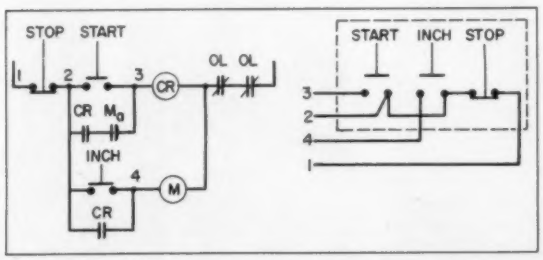


Fig. 17. A more complicated inching circuit having a separate inching pushbutton and a double-pole control relay

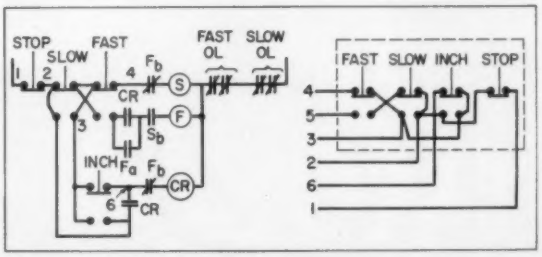


Fig. 18. Two-speed starter where control relay serves as a compelling relay to make sure motor starts at low speed

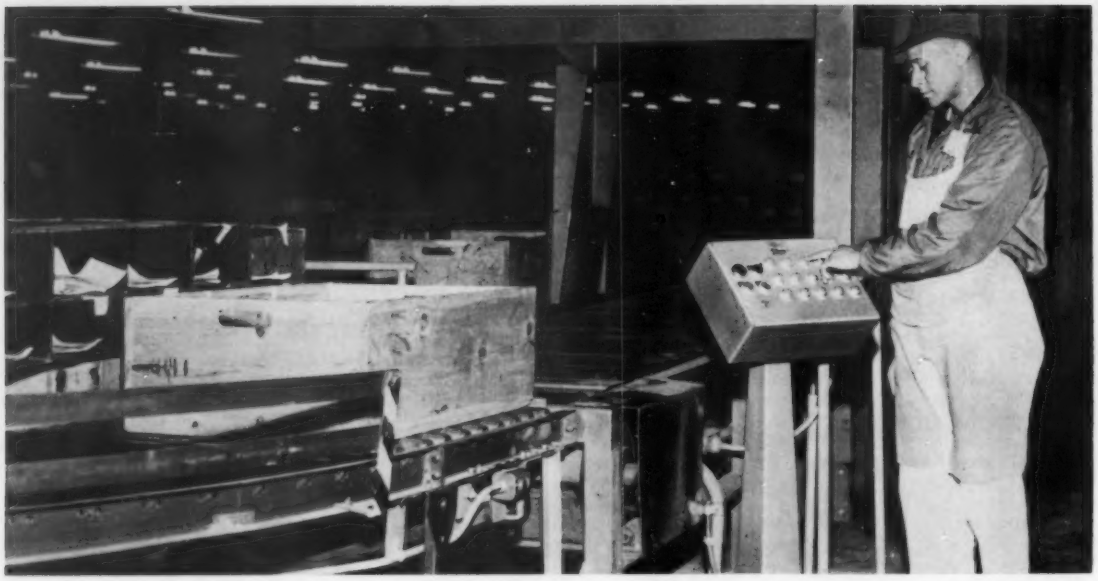


Fig. 1. Conveyor operator at pedestal-mounted control station. Air-powered pusher at first branch conveyor is visible

Conveyor Control with a Memory

35-mm Magnetic Tape Remembers Where to Unload Conveyor

Pushbutton conveyor control installed in Air Force warehouses . . . Taped impulses actuate pneumatic pushers to move cartons on conveyors . . . Perforated magnetic tape gives non-slip synchronization . . . Multiple-conveyor, complex systems can be controlled

MAGNETIC tape-controlled conveyor system automatically discharges packages in any desired sequence, from two to 20 stations. The system has resulted in savings of more than $100,000 a year per unit at Air Force supply depots.

Called Asset — Automatic Selected Station Electronic Timer — the units are the first of their kind, and have been developed and installed by the A. J. Bayer Co., Los Angeles. Already in operation at seven Air Force bases, the units have reduced the time necessary to handle a typical warehouse job from 40 hours to a matter of four or five hours.

The system is designed for use on transportation-discharge conveyors, for shunting packages, cartons, boxes or crates off a main conveyor line to a series of branch conveyors. The main conveyor can be installed to run down one side of a warehouse, past bays and storage areas for different types of goods. At each bay, a discharge conveyor can be installed at a 90-deg angle to convey material into that bay.

Asset makes it possible for a single operator at the loading end of the conveyor to note the type of goods in each package as it approaches, decide the area in the warehouse where it should be stored, and push a selector button associated with that particular discharge conveyor.

The unit starts functioning when the moving package interrupts the beam of a photoelectric cell at the side of the main conveyor, near the operator. Its magnetic tape memory takes over, and automatically routes each package on the main conveyor to the appropriate branch conveyor, and centers it on the branch conveyor.

The Asset system consists essentially of a "scale model" of the conveyor layout, in magnetic tape—the endless belt-type conveyor is reduced to a proportionate length of 35-mm double-perforated magnetic film, made by Minnesota Mining and Manufacturing Co.

The conveyor and tape are locked in synchronization, with the tape geared down 6 to 1 so that the conveyor speed of 48 fpm is represented by a tape speed of only eight fpm. The distance from the photocell to the farthest "pusher" or branch conveyor determines the length of the tape, which is wormed back and forth over rollers to save panel space.

An impulse, representing a package

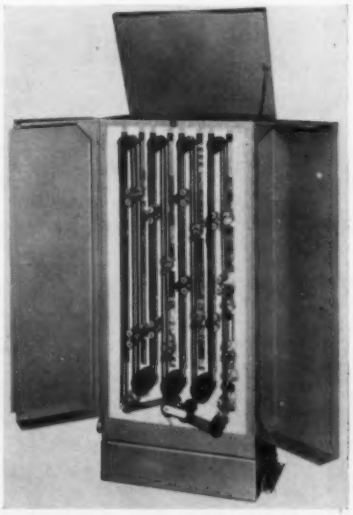


Fig. 2. Typical unit for a 14-station conveyor, employing two magnetic tapes

on the conveyor, is automatically recorded on the endless-loop magnetic tape, while each branch conveyor is represented by a playback head or pick-up, in the control panel.

A centering device finds the exact centerline of each package, regardless of length, and the impulse is put on the tape where the package center reaches a fixed point on the conveyor —called the timing line. It is important that the pusher contact the package at its center, to avoid the possibility of pushing a package off the main conveyor in such a way that it will fall off the branch conveyor.

So that the system can handle more than one discharge conveyor, five recording heads, one for each conveyor, are lined up in a bank across the 35-mm tape. Each of the five heads has its own channel down the tape, with an unrecorded space between the channels.

Corresponding playback heads for each conveyor are mounted in the respective channels, at distances along the tape that are proportionate to the locations of the discharge conveyors. For example, if the first discharge conveyor is located 12 ft from the timing line, the first playback head will be located two feet from the row of recording heads, maintaining the 6 to 1 ratio.

Multi-Conveyor Control

If more than five discharge conveyors are to be controlled, a second bank of five recording heads is mounted at a second position across the tape—slightly offset, so that the heads record in the spaces between the first five channels. For more than 10 channels, a second or third tape layout is added to the panel.

When the operator decides the area of the warehouse to which a particular package should go, he pushes a selector button on his control panel (See Fig. 1) for the branch conveyor leading into that area. This energizes the recording head in that conveyor's channel on the tape.

As the centerline of the package reaches the timing line, an impulse is automatically recorded in the selected channel on the tape. As the package moves down the main conveyor, the impulse is automatically recorded in the main conveyor, the impulse on the tape moves toward its playback head. When it reaches the head, a relay is tripped to operate a pneumatic-powered pusher which sweeps the package off the main conveyor onto the discharge conveyor.

The operator for the unit is stationed at the pedestal-mounted control station —which is equipped with a selector button for each discharge point along the main conveyor. Each button contains an integral pilot light which is illuminated when the button is pushed. This feature permits the operator to verify his action, and to correct an error, if necessary, by using a "cancellation" switch provided.

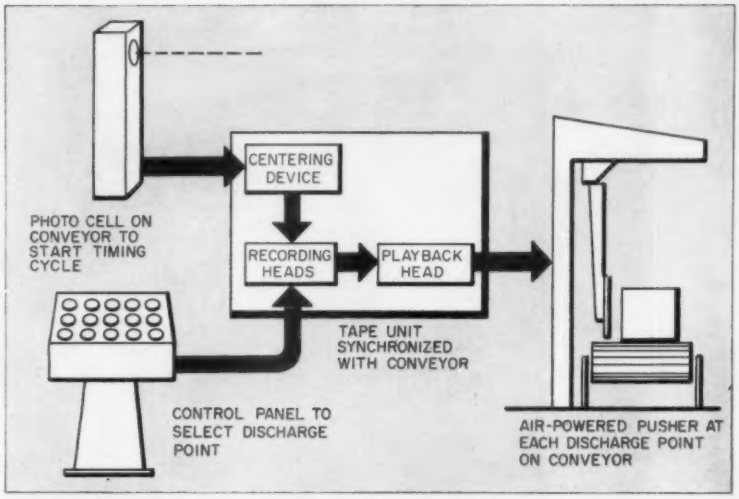

CENTERING DEVICE
PHOTO CELL ON CONVEYOR TO START TIMING CYCLE
RECORDING HEADS
PLAYBACK HEAD
TAPE UNIT SYNCHRONIZED WITH CONVEYOR
CONTROL PANEL TO SELECT DISCHARGE POINT
AIR-POWERED PUSHER AT EACH DISCHARGE POINT ON CONVEYOR

Fig. 3. Schematic diagram of system shows flow of control information from pushbutton station, through tape and playback head to pusher at branch conveyor

For discharging a series of packages at the same station without depressing the proper button for each package, a "repeat" button is provided. And, to indicate the progress of any particular sensing operation, a red warning light on the panel goes on when the package cuts the photoelectric beam, and stays on until the signal is recorded on the tape and the relays have returned to normal.

Magnetic tape was chosen as the control medium largely because of the precision control possible with the tape. This feature is especially important for centering packages of various lengths. Using the double-perforated 35-mm film, rather than conventional quarter-inch magnetic tape, perfect synchronization is possible by virtue of the sprocket drive. The tape and conveyor are always in phase, since slippage is eliminated.

Forecasts for the future of the system are based on consideration of the memory system possible with the tape —where more intricate conveyor systems, with secondary discharge stations on the primary discharge conveyors themselves could be controlled. Also, a system may have multiple loading points where a number of operators may initiate station selections.

Fig. 4. From the Asset unit (Fig. 3) shown here inside conveyor turn, signal is sent to relay controlling operation of branch conveyor pusher (shown at left)

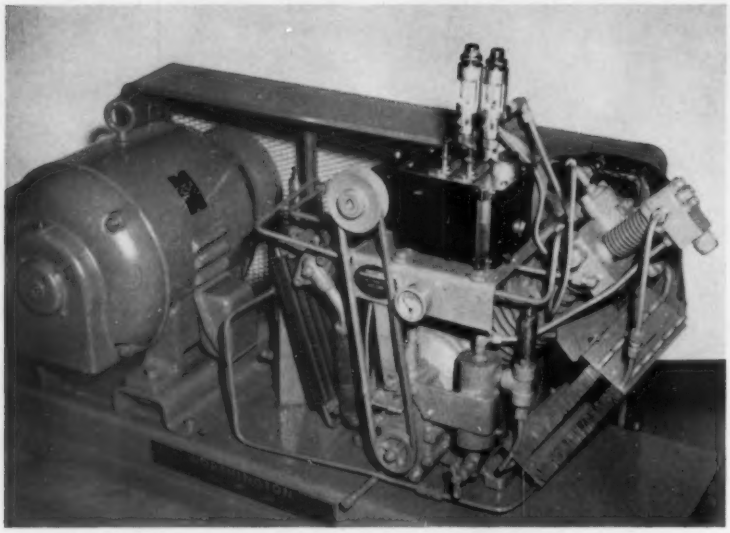


Fig. 1. Four-stage compressor with 3500 psi discharge, typical of those discussed

Capacity Control of Small Compressors

Air compressors must be controlled, and varying types of air demand require varying types of control . . . Author outlines features of several types, describing attributes and limitations of each . . . Unloaders are important

By S. R. HIRSCH, Executive Engineer, Holyoke Works, Worthington Corporation

FOR INDUSTRIAL supply applications most air compressors have to be supplied with means for regulating the air supply, since air demands are seldom constant. To confine this discussion to reasonable limits, air-cooled compressors for discharge pressures ranging from 40 to 5000 psig, and horsepower ratings from 1 to 100, will be considered.

Basically, there are three common types of air demand: intermittent demand, with wide time gaps between needs — usually supplied with start-stop control; fluctuating demand, with short time intervals between needs — control recommendation is constant speed pressure control; varying demand, such that at certain times either control method may be in order—for this situation, dual control is generally specified.

The discharge pressure serves as a ready control indicator to judge the demand for air. If it rises, less air is being used and if it falls, more air is needed.

A pressure switch can be arranged to open the electric circuit to the compressor drive motor when the "cut out", or maximum pressure, is reached, and close the circuit when the "cut in", or minimum pressure, occurs. Since it has been found necessary not only to disconnect the motor from the line, but also to unload the compressor for restarting, the pressure switch has been provided with a release valve which opens to bleed air from the discharge line during the shutdown of the compressor. This pressure switch-release valve combination serves almost singlehandedly to solve the problem of start-stop control.

There are occasions when a control that functions entirely pneumatically is needed to provide air to operate a valve or plunger to unload the compressor.

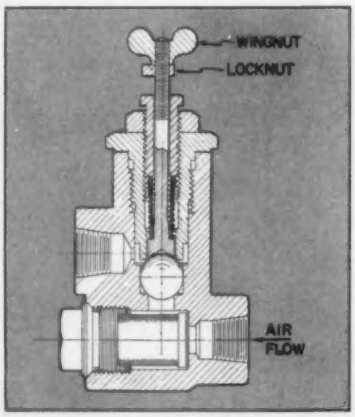


Fig. 2. Trigger valve for use on compressor systems ranging up to 300 psi

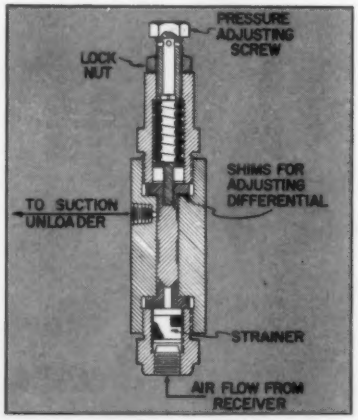


Fig. 3. Trigger valve designed to function on compressor systems to 5000 psi

When "cut in" pressure resets the control, air is allowed to escape from the unloader, repositioning the unloader devices and loading the compressor again. Such mechanisms, called trigger valves, are available to 5000 psig control pressure. See Fig. 2 and 3.

If a compressor is shut down, it cannot be started against full tank pressure, unless it is driven by a motor with extremely high starting torque. Therefore, some means must be provided to prevent build up of pressure in the compressor until the motor reaches full speed. There are two ways in which this can be done, and both must be automatic. The first, used for the smaller size compressors to 20 hp, works on the principle that the small compressor takes a while to build up pressure in its discharge line, and the compressor will reach full

speed before sufficient pressure has developed to affect motor loading. This method required a check valve in the discharge line ahead of the air receiver, to hold back tank air while the discharge line is bled to atmosphere each time the compressor stops.

The second method of initial unloading for starting compressors against no load is used on equipment above 20 hp. It requires holding open the suction valves during the starting period, then releasing them to function normally after the compressor reaches full speed. The second method is rarely furnished alone—it is usually combined with dual controls.

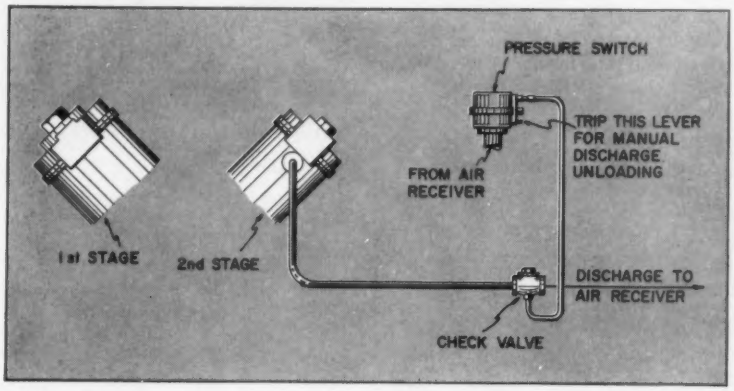


Fig. 4. Simplest form of start-stop control for 40-250 psi includes check valve

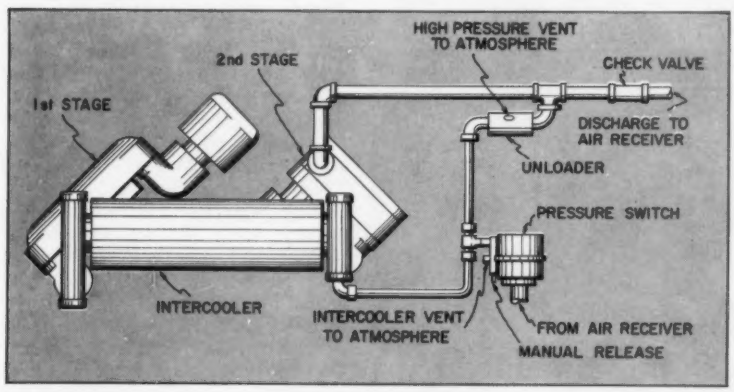


Fig. 5. Start-stop control for pressures to 500 psi has a high pressure vent

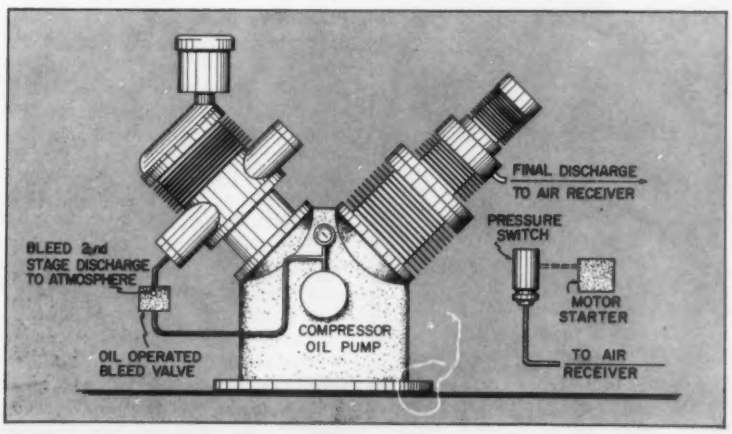


Fig. 6. For above 500 psi, oil system is used to actuate bleed valve on shutdown

Pressure Switch Ups Capacity

The first method, illustrated in Fig. 4, for start-stop service is adequate for pressures up to 500 psig, if a pressure switch is employed with a relay valve to relieve the discharge pressure and the intermediate pressure, as shown in Fig. 5. For pressures above 500 psig, and especially if force-feed lubrication is available, a drop in hydraulic oil pressure when the machine stops will perform the function of opening a bleed line from one of the intercoolers to atmosphere (in a four-stage unit, bleeding the second stage intercooler is adequate). This bleed line is closed when the unit starts and oil pressure builds up. See Fig. 6.

Good examples of types of systems that employ start-stop control are: automobile service station (pressures to 175 psig); diesel engine starting sets (pressure to 300 psig); sprinkler compressors (pressures to 80 psig) and leakage testing work (pressures to 500 psig).

Unloading at constant speed can be done in three ways: throttling or closing off the suction; holding open the suction compressor valve, so air drawn into the cylinder is promptly pushed out again; permitting large compression ratios per cylinder to develop zero volumetric efficiency. This

method is only used on high pressure compressors.

An excellent means of understanding the function which unloading performs is to compare the operation at full load and no load, on an indicator card. When Method 1 is used for unloading, the air intake is completely blocked off and sufficient vacuum is developed in the cylinder to unload it. As indicated in Fig. 7a, the area of the card indicates practically no power requirement, so this method does reduce the load requirement proportionally.

Method 2, shown in Fig. 7b indicates the resulting action. This also shows a small area representing the power required to draw air into the cylinder through the forcibly held open suction valve and then blow it out the same valve again.

Method 1 can be done very well for small air-cooled compressors without overheating. The mechanism, Fig. 8, involves only a closure valve which is mounted in the suction line. Since there must be means to close this valve when the discharge air pressure reaches a preset point, a trigger valve is used to start the operation, admitting receiver pressure to the plunger which closes off the suction line.

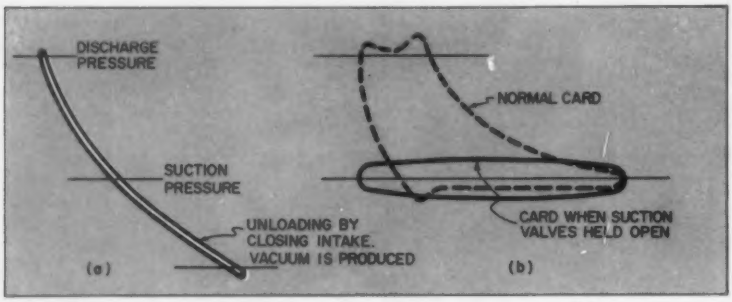


Fig. 7. Indicator card (a) air intake is blocked off; (b) with suction valves open

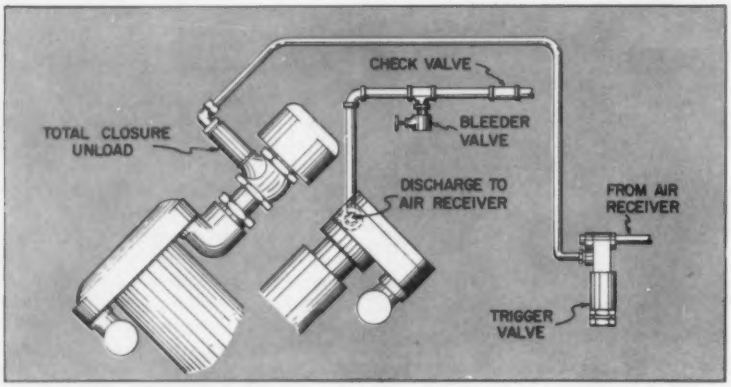


Fig. 8. Closure valve, mounted on suction line, is controlled by trigger valve

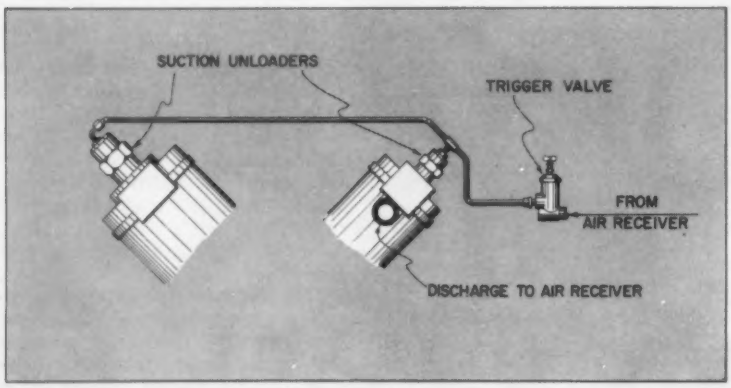


Fig. 9. Suction unloaders are operated by air pressure released by trigger valve

"They claim it'll run a month on one tank of fuel."

Method 2, which is preferred, is shown in Fig. 9. Air pressure is introduced to a plunger which actuates fingers that bear on the valve strips. The fingers are depressed and unloading of the cylinder results.

For pressures to 300 psig and because of the suitability of suction valve unloading elements, constant speed control method is the usual selection. A trigger valve will be needed to operate either the total closure unloader or the suction valve unloaders. When pressures are between 300 to 500 psig, a total closure unloader is used because of simpler elements.

When pressures approach 5000 psig, a combination of Method 2 and Method 3 lends itself to a practical method of control. The first and second stages are unloaded by Method 2, imposing on the two final stages such an increased compression ratio that they literally unload themselves.

This action can be simply shown with an indicator card as in Fig. 10. This shows a 4-stage compressor card. When unloading occurs, the first and second stages are unloaded by holding open suction valves. The suction pressure of the second stage drops to atmospheric, therefore the solid line areas around the suction line indicate the work done by the first and second stages during this operation. The third and fourth stages must now compress from lower pressures to final discharge. The attempt is unsuccessful because at such large ratios, and because of the built-in large cylinder clearances, the volumetric efficiency becomes zero. The small solid line area shows the amount of power involved which is about equivalent to total closure unloading. Thus this method of unloading for multi-stage compressors, a combination of suction unloading and unloading by large compression ratio, is very effective and efficient for small compressors.

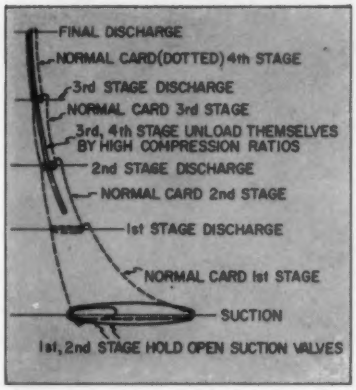

FINAL DISCHARGE
NORMAL CARD(DOTTED) 4th STAGE
3rd STAGE DISCHARGE
NORMAL CARD 3rd STAGE
3rd, 4th STAGE UNLOAD THEMSELVES BY HIGH COMPRESSION RATIOS
2nd STAGE DISCHARGE
NORMAL CARD 2nd STAGE
1st STAGE DISCHARGE
NORMAL CARD 1st STAGE
SUCTION
1st, 2nd STAGE HOLD OPEN SUCTION VALVES

Fig. 10. Indicator card for 4-stage compressor. First and second stages are unloaded by holding suction valve open

When compressors are furnished with constant speed control alone, there is no need to provide automatic unload at start. Manual means are made available on the trigger valve (see wing nut on valve in Fig. 2) to force it open by hand to render the suction valves inoperative.

When a total closure unloader is used with a trigger valve for constant speed control, manipulation of the trigger valve at start merely closes the closure unloader but does not provide initial unloading. In such cases partial reversion to the setup for start-stop control must be made. A discharge check and a manual bleeder valve to blow down the discharge line are needed for starting against receiver pressure. See Fig. 8.

Examples of air systems that need almost constant air supply suggesting constant speed operation are: laundry service, plant air, air tool demands.

The compressor furnished for dual control has equipment to allow either of the two methods of operation; start-stop or constant speed.

In sizes to 15 hp the compressor is fitted with both sets of parts to permit either method of operation. A manually operated selector valve puts the compressor on the system desired. This arrangement is illustrated in Fig. 11.

In sizes above 15 hp, there is a simplification of elements brought about by combining some of the functions. The pressure switch is used in both start-stop and constant speed operations. Here, the trigger valve is eliminated but a magnetic unloader is substituted, as shown in Fig. 12. When the selector switch is positioned for start-stop service, the pressure switch disconnects the motor, de-energizes the magnetic unloader and feeds discharge air to the suction unloaders on the compressor. Upon restart, the motor starts and when the release valve bleeds discharge air from the unloader lines to atmosphere, there is a leaking check valve in the line which prevents immediate escape so the suction valves remain inoperative long enough to permit the compressor to come to speed.

When the selector switch is positioned for constant speed control, the pressure switch is disconnected from the motor starter and acts only on the magnetic unloader. The motor runs continuously while the compressor unloads according to the discharge pressure setting.

For pressures between 300 and 500 psig, dual control has been provided by duplicating the complete elements of the individual control. (See Figs. 5, 6, 8.) Selection is made by opening or closing hand valves as desired. This arrangement is necessary because combination elements for these high pressures are not available.

Dual control for high pressures in the order of 2500-5000 psig can be provided by combining the features of start-stop initial unloading with the constant speed control already described, and by the use of a hand selector valve as arranged for the 500 psig operation. High pressure compressors are usually specified for special services and dual control is rarely called for.

It is possible to design a timing system which will automatically switch from start-stop to constant speed control depending upon air usage. It could be arranged to switch to constant speed if there were more than one or two starts per minute, or if a continuous unload of longer than 10 or 15 minutes occurred, to switch back again. Generally, however, the switch from either method is done manually.

A perfect example of the use of dual control would be that of a plant air supply. At night, for standby requirements, the compressor could be switched to start-stop control.

With the availability of the types of unloading discussed, it is possible to adapt the small compressor (1 through 100 hp) to the most widely fluctuating loads. This makes the small compressor a dependable and satisfactory source of air supply for the most diverse industrial application.

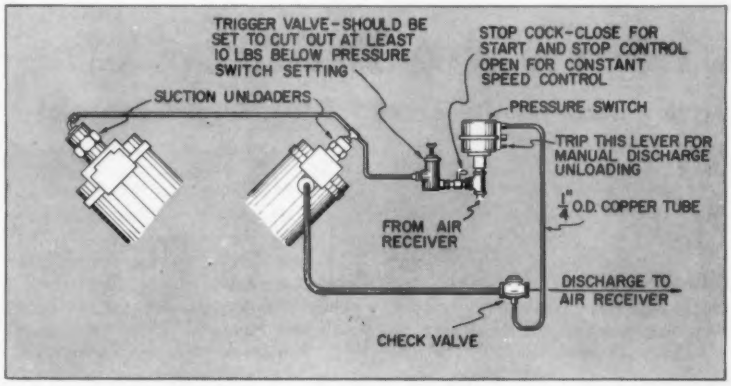

TRIGGER VALVE-SHOULD BE SET TO CUT OUT AT LEAST 10 LBS BELOW PRESSURE SWITCH SETTING
STOP COCK-CLOSE FOR START AND STOP CONTROL OPEN FOR CONSTANT SPEED CONTROL
SUCTION UNLOADERS
PRESSURE SWITCH
TRIP THIS LEVER FOR MANUAL DISCHARGE UNLOADING
1/4" O.D. COPPER TUBE
FROM AIR RECEIVER
DISCHARGE TO AIR RECEIVER
CHECK VALVE

Fig. 11. Compressor fitted with dual control. Stop cock selects control desired

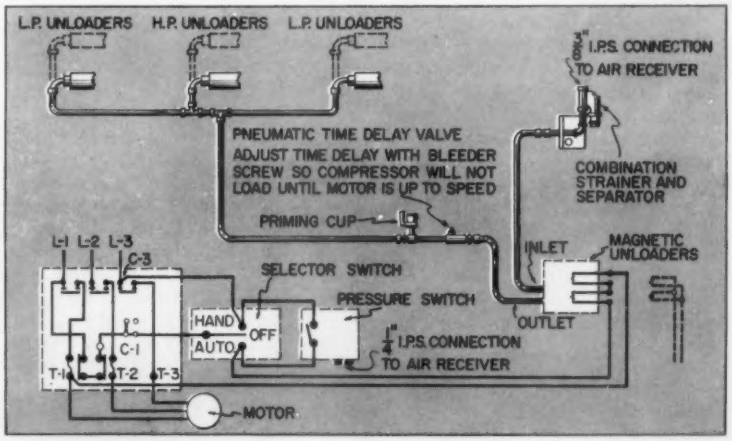


Fig. 12. For compressors above 15 hp, magnetic unloaders are substituted in dual control systems. In this instance the trigger valve has been eliminated

Fig. 1. Floating on surface of river, effluent line stretches from plant, top, to end float, bottom, to reach river channel

Underwater Effluent Line—

Burlington Industries' Floating Assembly Job

DYE PLANT EFFLUENT, discharged into the sanitary sewer system of the Cramerton, N. C. plant of Burlington Industries, Inc., was found to be overtaxing the system. Installation of a pipe line, to carry the effluent out into the river channel (dammed to form a lake) proved to be an unusual, but successful remedy.

Calling on experience gained in a previous similar situation at another of the company's plants, the plant engineers undertook the laying of a 24-in. pipe line for a distance of 500 ft underground and 3220 ft underwater to the center of the river channel. Engineers of the Armco Drainage & Metal Products, Inc., who had worked on the previous installation, were again called in to consult.

The first 500 ft of the line were installed underground from the dye plant to the edge of the water. The remaining 3220 ft rest on the bottom of the lake. That part of the line leading from the dye plant to the water's edge is Armco 24-in. Asbestos-Bonded pipe, asphalt-coated and quarter-paved, while the portion under water is simply coated. Paving was unnecessary in the line resting on the bottom of the lake because it will be running full at all times, the velocity so low that there will be no erosion problem.

The entire underwater line, assembled in 18-ft lengths on the shore, was pushed out into the water as each joint was made. The open end of the first pipe was fitted with a water-tight wooden plug as a safety measure and supported on a wooden raft to keep it above water. All joints were made with 2-foot one-piece bands and six threaded rod hoops. The ends of these rod hoops were passed through lugs and drawn up tightly with standard nuts.

To insure water-tight joints, the asphalt coating was heated with a blow torch at the point where the pipe fits under the end corrugations of the bands. The asphalt then flowed slightly under pressure of tightening. The torch was used again after the joint was made up to insure a tight seal. Used motor oil was wiped over the area of the pipe under the bands, to facilitate the band sliding over the pipe as it was drawn up tight. All nuts were tightened with an air-operated wrench. Although the line floated on the water for more than three weeks before the assembly was completed, no serious leaks developed.

Even when more than 3000 ft of pipe was floating on the water, it was a simple matter for four men to push the line farther into the lake as each new 18-ft section was added. In a normal 8-hour working day it was possible for a foreman, a crane operator and seven laborers to join and float 360 to 400 linear feet of pipe into the lake. An additional man in a boat guided the forward end of the pipe and adjusted guy wires to keep the line in proper position. When the entire line was assembled, it was guided into location and the open forward end unplugged. Water entering the pipe sank it into position, completing the installation.

Fig. 2. View of the launching site

No-Draft Air Conditioning

Diffusing Plates Slow Air Speed, Don't Cut Volume

EXPERIMENTS involving the use of benzene, ether, chlorine, ammonia and other substances which produce explosive or toxic gases are common in the biological and chemical research laboratories of the G. D. Searle Co., pharmaceutical manufacturers in Skokie, Illinois.

Removal of these dangerous fumes presented the company with a serious and complex air conditioning problem. Fume removal was accomplished by equipping each pair of hoods (under which experiments are conducted) with exhaust ducting leading to a small high-velocity fan, capacity 1000 cfm, mounted under a Transite vent on the roof. These fans draw off the fumes from an experiment being conducted in a hood, and disperse them into the air above the building. Figure 1 shows the layout of these fans on the roof of the building.

However, when the majority of the 50 hoods were operating at the same time, pressure inside the building dropped sharply. Under this negative pressure, when any particular fan was shut off, some of the fumes it had been expelling would rush back into the building, without hindrance, through the exhaust hood.

To maintain some standard of air intake and loss, a plant regulation was invoked, requiring 60 per cent of the hoods to be in operation at all times. Total air loss under this procedure amounted to 15,000 cfm, and when all the hoods were in operation, the air loss amounted to 25,000 cfm.

This relatively large air movement often produced drafts that were detrimental to the experiments being conducted.

The installation of special low velocity, high capacity air diffusers in each room being supplied with air proved to be the answer to the problem of providing the required number of air changes per hour—15—while keeping air movement to a low 40 to 50 fpm.

The air diffuser, manufactured by the Multi-Vent Div. of the Pyle-National Company, Chicago, is relatively simple in construction and operation. Air moving from the duct passes through a circular orifice valve and then is "washed" over a panel drilled with thousands of tiny holes. Air which has been traveling as high as 150 fpm is slowed to 40 to 50 fpm, by the time it leaves the diffuser.

Because of the large area of the panel—18 sq ft—as much air is delivered as if it were simply blown into the area.

The building halls serve as return air ducts and because the number of fume hoods in use varied above the 60 per cent standard, it was found necessary to vary the intake to balance the number of hoods in use. This is accomplished automatically, through five static pressure valves positioned in the return-duct corridors. The valves electrically control the air intake louvers, varying the opening to keep the pressure in the building as nearly constant as possible.

Each room in the laboratory requires an average of 750 cfm and is served by two low velocity air diffusing units. Each air diffuser measures 3 by 6 ft and fits flush with the ceiling.

Servicing the air conditioning needs of the research laboratory is a 350-ton refrigeration unit, which chills water circulated through pipes in a fan room in the center of the building. The fan blows chilled air through ducts running above the halls in the building. Each room of the lab has two separate lead-offs from the main duct.

In other buildings on the plant site, different problems are experienced in operations such as capsule manufacturing, but the basic solution has been the same—high number of air changes with slight air movement.

Fig. 1. Portion of exhaust fans on laboratory roof. Ducts are of Transite

Fig. 2. Air intake, at end of building court, has automatic control for louvers

Fig. 3. Typical laboratory in building. Air diffusers in ceiling provide ventilation with no drafts to affect instrumentation or the delicate controls adversely

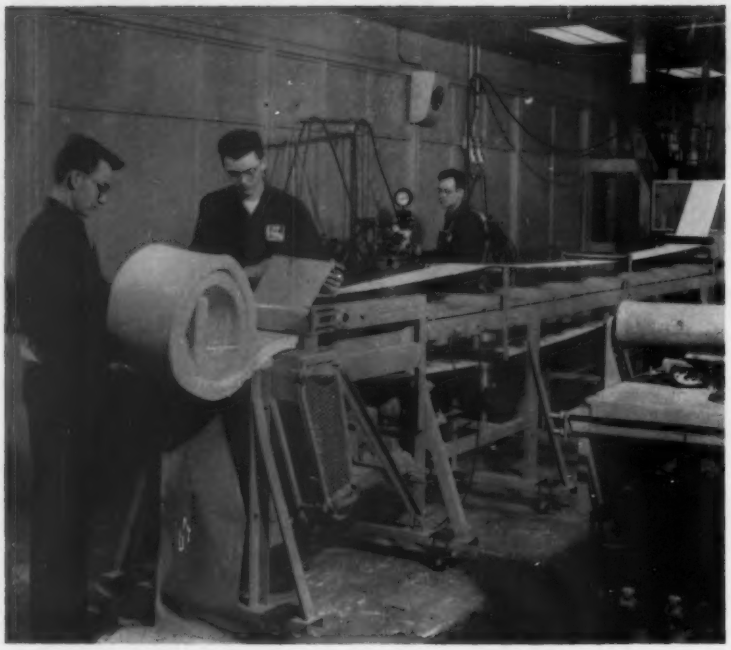


Fig. 1. This experimental unit for continuous manufacture of urethane foams was devised by Du Pont's technicians to study isocyanate production techniques

New Elastomers Lab Says: "At Your Service"

HOW CAN new rubber developments help industry solve some of its problems? The answer to this question is being sought every day at Du Pont's new Elastomers Laboratory at Chestnut Run, near Wilmington, Delaware.

The laboratory is designed to provide technical service on neoprene, synthetic rubber, organic isocyanates and rubber chemicals. It can duplicate on a pilot-plant scale many operations in rubber manufacture.

Separate laboratory areas are provided for isocyanate work, adhesives, paper, dry-polymer processing, latex, physical testing and consumer-product testing. Processing and testing facilities are of the latest type for both liquid and dry rubbers.

As an indication of its scope, the new laboratory is equipped to manufacture tire treads, apply them to carcasses, then cure and test the finished tires. It has an experimental unit for continuous manufacture of urethane foams, and a pilot-plant installation for continuous extrusion of electrical wire coverings.

The mill room of the laboratory is equipped with special rubber mills on which roll speeds and ratios can be varied, and stocks may be milled at any temperature from 50 to 330 F.

A special feature of the mill room is the color area. Completely isolated from the carbon black area of the main mill room are the non-black and color rooms. These are independently equipped with their own mills and presses. Special lighting is installed to permit accurate color-matching.

Special Equipment for Research

The laboratory is also set up for calendering on a production line basis. A specially-built press can operate at temperatures up to 500 F for studying greatly accelerated curing rates and high-speed molding techniques.

The latex area consists of various sub-areas where evaluations are made of natural and synthetic latices in such products as dipped goods, paper, elasticized concrete and foams.

Urethane foam developments and end-product applications are conducted in a third laboratory area. The development area, complete with separate air conditioning equipment and specially designed hooded benches, provides means for a wide diversification of product activity. The application area includes such equipment as a continuous foam table, walk-in spray booth, pre-polymer kettle and portable foaming units.

The testing area includes standard industry equipment as well as several pieces of specialized design. All types of evaluations for both new developments and finished industrial and consumer goods are conducted in this area. Included are separate sections maintained at various temperatures, humidities or other conditions for specialized testing.

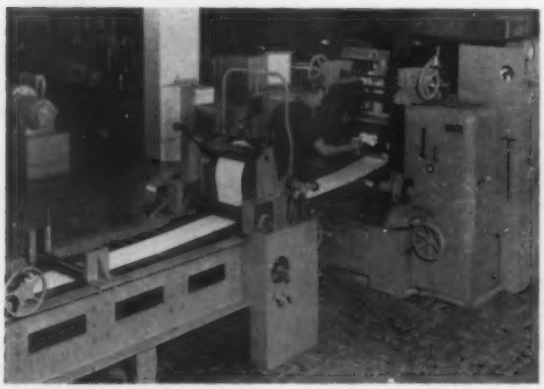


Fig. 2. One of the many pilot-plant installations is this three-roll calender, duplicating commercial production set-up

Fig. 3. Wire covering equipment at the new laboratory consists of payoff, extruder, capstan, takeoff and vulcanizer

Bob Hiller, President of the American Institute of Plant Engineers, holds scroll presented to him by members of the Plant Engineers' Assn of Pittsburgh. Men identified in the photograph are, left to right: Dr. R. B. Teare, Jr., Dean of College of Engineering and Science, Carnegie Institute of Technology; W. E. Clark, Executive Vice President, Dravo Corp.; R. W. Hiller; R. P. Crane, Plant Engineer, The Duraloy Co.; L. W. Cook, Pennsylvania Society of Prof. Engineers

The Plant Engineer's Role in Industry

ROBERT W. HILLER, Plant Engineer, Dravo Corp., Pittsburgh, Pa., and past president of the Plant Engineers' Association of Pittsburgh, was honored recently at a testimonial dinner given by members of the Pittsburgh Chapter on his election to President of the American Institute of Plant Engineers.

After thanking the members of the Pittsburgh Association for their thoughtfulness, Bob Hiller gave a brief talk on the subject: The Plant Engineer and His Role in Industry. Portions of his talk are quoted below:

"There are many men who for many years have done the job and have borne the true title of Plant Engineer; however, the fact that they generally confine practice to the inner workings of some fixed industrial or commercial establishment has been a factor contributing to obscurity to the extent that many persons who are otherwise well informed will ask: 'What is a Plant Engineer?' 'What does he do?'

"Now, I would be the last person to attempt a recital of the various things the Plant Engineer does. The list would be longer than your arm; every Plant Engineer would have a different list; and before one could add the last items to the list, the first will have already changed. But let's look at it this way—every successful industrial plant is a continuously evolving, changing, improving, expanding, complexity of physical property and mechanical apparatus. No plant today is the same as it was five years or two years ago.

"Constant change creates demands for more prime-moving elements, be it more prime-moving elements, be it generated or purchased power; solid, liquid or gaseous fuels; more water for processing or cooling purposes; a whole host of new maintenance materials and techniques; new and better methods in the disposal of wastes.

Specialist on Plant Problems

"All of these changes point up the need for and the usefulness of the Plant Engineer. Efficient administration and control of these problems must be delegated by management to a specialist on the same basis that sales, product engineering, procurement, production, accounting, auditing, legal, etc., are assigned to specialists in those particular fields. The Plant Engineer is the specialist delegated by management to handle these problems.

"His interests lap over into the realms of all engineering branches and thus he seeks to become a specialist on an area basis—the area being his particular plant. He must learn to know his plant thoroughly; the geology that supports the foundations and provides or perhaps fails to provide water for his deep wells; the pitch and grade of the surface for his drainage problems; the structures that house men and machines; the life blood of power, water, air, gas and steam distribution systems; new layouts for smooth production flow and related materials handling equipment; the care and repair of machinery, of transportation, of communications—all adjusted to conform to established management policies and then carefully re-adjusted to suit the temperament and attitude of management at the time the problem arises and as it may be affected by the profit picture, the status of backlog and other considerations.

"He must help in the development of budgets and in turn be restricted by them; he must be capable of predicting and eventually analyzing the returns on funds invested in capital equipment; he is constantly estimating, justifying, selling management on the requirements of the workers and in turn diplomatically selling the working forces on the desires or demands of management, and in addition, meeting emergencies as they arise. This, gentlemen, is the Plant Engineer."

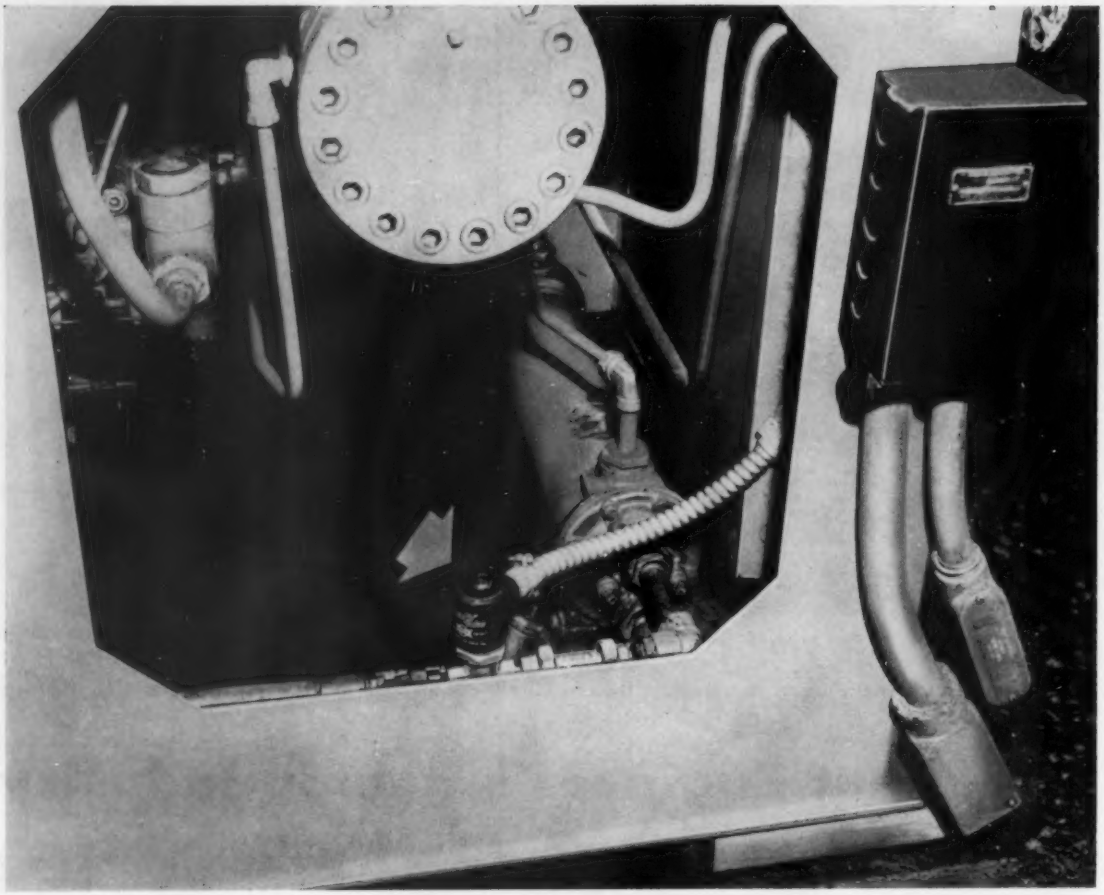


Fig. 1. Close-up photograph showing the flow control valve installed on one of Erie Resistor's plastics molding machines

Erie Resistor's Water Conservation Program Means:

No Water Dollars Down the Drain

By L. L. BUZZARD, Hays Manufacturing Co., Erie, Pa.

MOST INDUSTRIES, particularly those in water-short areas, realize that water is changing from a plentiful natural resource to a precious and expensive commodity. In addition, the cost of water distribution is increasing steadily even in areas of comparative abundance.

The plant of Erie Resistor Co. is a case in point. Situated near Lake Erie, it nevertheless found itself in a most uneconomical position in respect to water usage. In order to determine just what its position was, Erie Resistor, in concert with a manufacturer of flow control devices, Hays Manufacturing Company, conducted a survey throughout its plant to check on water usage and waste.

Greatest concentration of water-hogs found in the plant was in the plastics molding machine area. Considerable quantities of water were being poured needlessly into the drain every hour and these gallons were producing no tangible benefits.

There were 23 plastics molding machines to which the program was applied. Water was used in these machines for cooling the hydraulic oil which operated the units. Manually-operated valves (which were part of the original installation) on the cooling water lines leading to the heat exchanger were seldom shut off during rest or lunch periods, shift changes, or when re-tooling the machines.

In order to discover just how much water was needlessly being run to the sewers the two companies utilized meters and positive displacement methods. Next step was to find out how *little* water could be used and still maintain the desired cooling effect on the hydraulic oil.

An economical flow rate was established by gradually throttling the cooling water through the mechanical valves. While doing so the engineers kept close check on the temperature of the hydraulic oil. At the point where no rise in temperature could be observed they established the proper flow rate.

Inasmuch as the flow tests were made during the winter months it was decided to permit a 33⅓ per cent greater flow to take care of the cooling water's higher temperature during the summer months. Results of the

study showing the uncontrolled flow rate and the permissible controlled flow rate are shown in Table I.

To sum up, reasons for the water wastage were: 1. uncontrolled flow at a rate far greater than was necessary to obtain desired cooling effect; 2. continuous flow regardless of operating periods of the machines. The problem was, then, simply one of cutting down on the rate of water flow and completely shutting off water flow when the machine was not in operation.

In order to control the rate of flow a mechanical flow-rate control device, designed to deliver a set rate of fluid flow regardless of variable pressure, was installed on each of the machines. When the machine was running this made sure that no more water than was needed was being used in the heat exchanger.

In order to make certain that the water was shut off when the machine was not operating, electrically-operated "on" and "off" valves were wired in series with the main control switch of each machine. They start and stop the flow of cooling water in concert with the "on" or "off" operation of the molding machine. Thus, cooling water is being used only at times when it will cool something.

Metering of cooling water was done following installation of the control devices to determine just how effective they had been in lower costs and reduced water usage. By computing the number of shifts operating, number of days of week worked, and other governing factors, the before and after results were tabulated. These are shown in Table II.

Total installation expense, including the purchase of the controls, was $397.33 for the 23 machines. Inasmuch as there was a reduction in water usage on these machines of approximately 69 per cent, the costs were repaid by lower water and sewer bills within two months.

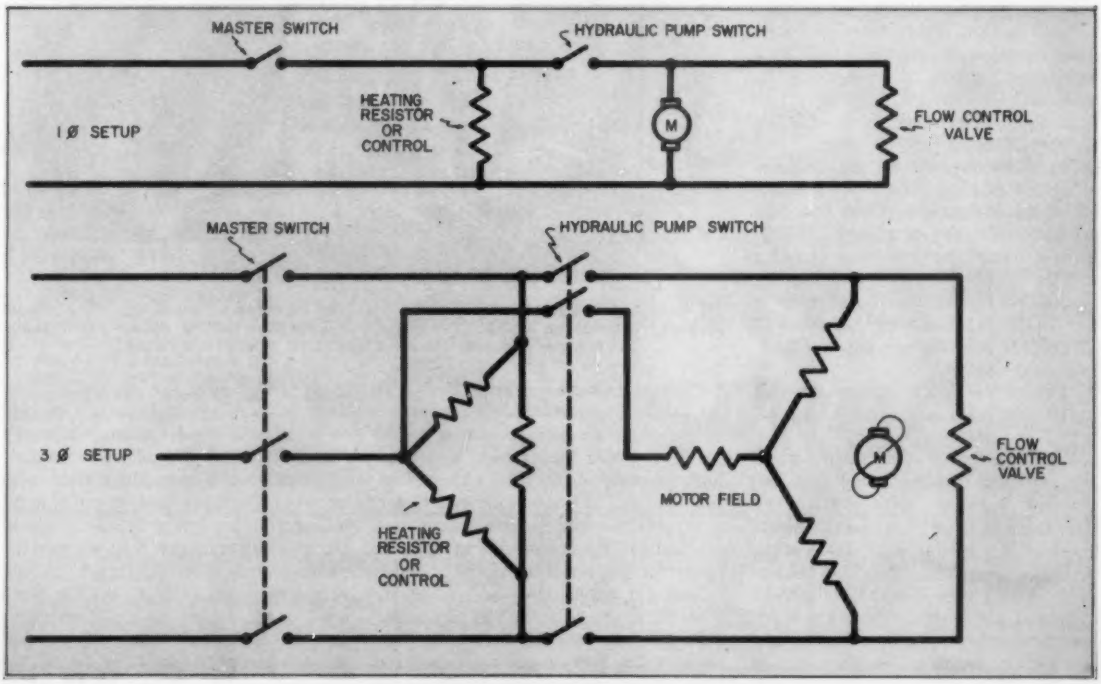
Table I. These were the figures revealed on the water usage picture and the savings possible with water conservation measures adopted on molding machines

Machine Code Letter	Machine Molding Capacity ounces	Determined Uncontrolled Flow Rate gpm	Permissible Controlled Flow Rate gpm
A	4	3.9	1.0
B	8	3.9	1.0
C	12	4.1	1.0
D	16	8.9	4.0
E	28	8.9	4.0
F	32	8.9	4.0
G	60	8.9	4.0

Table II. This was the amount of water saved by Erie Resistor Co. on each of 23 plastics molding machines. Also shown, total weekly conservation of water

Code Letter and Number of Machines Operating		Molding Capacity ounces	Weekly Conservation Per Machine gallons	Total Weekly Conservation gallons
A	1	4	29,232	29,232
B	10	8	38,137	381,370
C	3	12	31,248	93,744
D	4	16	49,392	197,568
E	1	28	49,392	49,392
F	1	32	49,392	49,392
G	3	60	72,818	218,454
			Total	1,019,454

Fig. 2. Wiring diagram for interlocking cooling water with hydraulic pump operation on injection molding machines



Let's Take a Look at Ourselves

Can Plant Engineers Do Better Job of Selling Maintenance?

By **MAURICE D. O'HERN**, Works Engineer, American Steel Foundries, Hammond, Indiana

"O wad some power the giftie gie us
to see oursel's as ithers see us!"

THIS ARTICLE is attempting to do just what Robert E. Burns mentioned in these two lines from the poem "To a Louse." Let's look at ourselves as others see Plant Engineers—or would like to see Plant Engineers.

For the purpose of this article we will use the terms plant engineer, chief maintenance engineer and chief mechanic interchangeably—any reference to one of them is intended to be a reference to all of them. Also, plant engineering and plant maintenance will be considered the same. Their fields are so close, their responsibilities are similar, their engineering approaches to projects are identical, and the management to whom they report is the same.

Mr. Average Plant Engineer

To establish a common ground we will create an average Plant Engineer. You are 46 years old, in better than average health, undoubtedly of better than average appearance, and have had several years of college—or its equivalent in special training. You have eight supervisors under you and an organization of 90 men. You maintain 10 acres of building, 20 acres of property, 15 million dollars worth of capital investment. Each year you are responsible for spending $1,250,000 in just about the following manner:

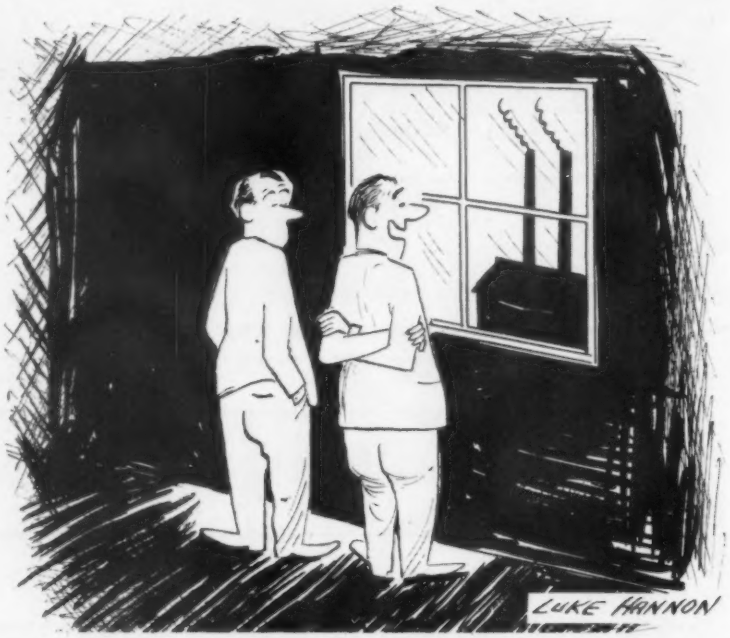
$500,000	for wages
300,000	for utilities (coal, gas, fuel oil, water, electricity)
200,000	maintenance supplies and service
150,000	for capital improvements
100,000	for maintenance of buildings

You have charge of all maintenance, are expected to be a competent mechanical engineer with unlimited knowledge of power distribution, steam generation, hydraulics, lubrication, machine design and handling equipment. You are an expert in all phases of millwright work. You are a qualified civil engineer able to handle any sewage or drainage problem, or to check on the county surveyor's plot of the company's property. You devise and make special purpose machinery. You also have a few side lines such as tool and die work, cabinet making, tinsmithing and masonry for furnaces.

You know how to put an abused hydraulic lathe back in working order in three minutes, how to repair gaping holes in the floor without impeding traffic, keep machines always available for production. You are also familiar with building furnaces, know the latest on burners and controls. You know how to keep that power factor at 96 per cent. You can repair a broken high pressure steam line without batting an eye. In your stride you repair a critical machine whose frame was cracked on Friday—and you have it ready for use on Monday.

You get phone calls at 1:30 A.M. There's not enough air. The city water pressure has dropped to nothing because of a broken main. You have to decide 10 miles from the plant what to do with your 50,000 lb boiler. At the other end of the phone is an excited watchman or a mumbling water tender. You maintain 1,000 pieces of capital equipment and 1,000 smaller items such as fans, heaters, switches, motors.

Of your eight supervisors, six are good men—they have everything you want in them; loyalty, cooperation, job knowledge and ability to handle men. Two of the eight are problems. One of them is marginal—not bad enough to replace—not good enough to carry his share of the load. The second problem is the competent man who knows everything and doesn't mind telling you, his fellow supervisors and the general manager how to run the plant. You yourself report to the works manager and are on the same level as the production superintendent, product engineer, works auditor, and personnel supervisor.



"I have eight supervisors, 90 men, maintain 10 acres of buildings, 20 acres of property, $15 million capital investment and I spend a million dollars every year! You know, Ed, sometimes I feel like a human dynamo!"

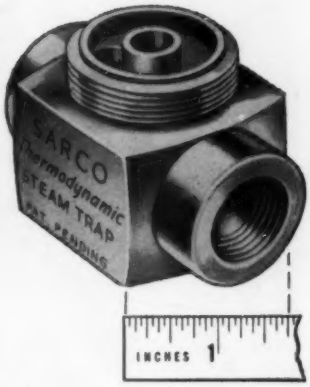
Now — A Revolutionary NEW Steam Trap!

What could be simpler?

1. A CAP

2. A DISC

3. A BODY



That's all!

Practically Eliminates Maintenance!

Look at this revolutionary new thermodynamic steam trap. Could it possibly be simpler? Look for the valve closing mechanism—there isn't any! The kinetic energy of steam closes the valve and *only* the TD uses this new operating principle.

Only 3 parts... cap, disc and body... machined from stainless steel bar stock... all extremely simple, rugged, durable. Only one moving part... a hardened SOLID stainless steel disc... practically wear-proof.

Just imagine how much time and expense this new TD steam trap can save you by greatly reducing and simplifying trap maintenance and inventory!

SOME OF MANY OTHER ADVANTAGES:

1. Use the same trap for 10-600 psi... for light or heavy loads ... without seat or valve change or other adjustments.
2. Closes tight on no load—no steam waste.
3. Operates against back pressures up to 50% of inlet pressure.
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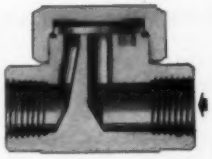
5. Only one spare part—solid stainless steel disc.

TROUBLE-FREE DESIGN

No valve-closing mechanism to wear or stick—the kinetic energy of steam closes the valve. No critical clearances to choke. No gaskets to leak. Only one moving part—a SOLID stainless steel disc.



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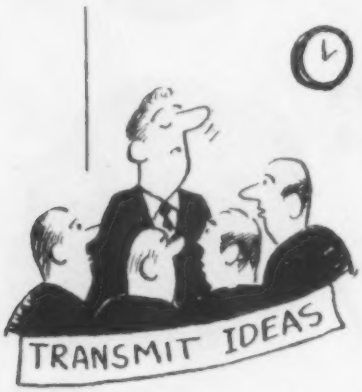
For more facts circle 567 on Reply Card

Aside from maintenance engineering you are responsible for all fire fighting facilities, act on the safety suggestion committee, take part in contract negotiations, and are an expert in dealing with a prima donna craftsman or a new helper.

You have two college graduate engineers working for you and both of them show considerable promise; you are wondering how you can pay them enough money to keep them — what with the company policy decided a hundred miles away.



You supervise the activities of all contractors, take their bids, recommend who gets the job, do the follow-up, and see that the company gets its dollar's worth. All in all, you are quite a man!

After going through the list of your responsibilities, it is obvious you are an integral part of management—you belong right up there with sales, production, accounting.

The time is long past in modern industry when the maintenance engineer was a tolerated evil. He is now an effective part of general management! Or at least he should be. If he is not a part of management, the Plant Engineer has no one to blame but himself!

Certainly maintenance engineering does not have to be sold to management when the maintenance engineer is a part of management. Does the sales department have to sell management on the necessity for sales? Absurd! Sales is a part of management. In the same manner in modern industry maintenance engineering is a part of management.

Rank yourself with the comptroller, the head of the production department. You belong there.

The sad truth, however, is that many Plant Engineers do not have such high caste. This is due to a variety of circumstances . . . some of which are your own fault. Let's take a look at the reasons some Plant Engineers are not considered a part of management. Plant Engineers have not made themselves professionals. Until they have acquired this professional status the Plant Engineer will not be accepted as a part of management. You have an equal responsibility but not yet an equal recognition. Let's find out why.

Historically the maintenance engineer has been a man with an excellent shop background. He knows machinery, utilities, construction. He has historically been a top craftsman—a pattern maker, a millwright, a top mechanic. No one can deny the value of a shop background for a Plant Engineer. It is one profession where book learning takes a back seat. However, it has taken the back seat too long.

Also, historically, the maintenance engineer has been—let's face it—the least vocal of the management group.

Use the Proper Tools

Put some Plant Engineers in front of 10 men in their own management category and they are paralyzed. How can he be considered an effective part of management when he cannot effectively transmit his thoughts in writing or in speaking. To sell maintenance engineering as a profession and to become a part of management you must use management tools.

One of these is effective report writing. Many Plant Engineers shun writing a one-page letter or report as if such a task were beyond the call of duty. Procrastination is not the ordinary mark of the Plant Engineer—action is his forte—except in his official communication with management. That report on the newly installed steam line takes a back seat to the present project of replacing the roof over the test laboratory.

Some Plant Engineers have the characteristic of being unable to show on paper a marked ability to assemble and analyze available information to guide management to a decision. This is not common with all maintenance engineers but it is a characteristic of many. They deliberately turn their backs on their most effective means of communication with top management. This occupational characteristic of inability to speak or write must be overcome to acquire one of the marks of a professional.

Many maintenance engineers are justly proud of their shop background. Sometimes they are a little too proud as it blinds them to one of the aspects of management which identifies the management man. This particular aspect is the short and long range planning. How did your maintenance forecast for last year compare with your actual performance? Or did you even make a forecast? Do you have a forecast for large maintenance expenditures that will be needed for the next five years? Your management is tremendously interested in these projected expenditures—but can they trust your forecast?

For purposes of comparison, take the case of the Plant Engineer who patted himself on the back because he came within $10,000 of a $200,000 forecast. Sounds good, doesnt it? Yet his manager cannot trust his forecast—half the items on the forecast were not performed—and some of this money was spent on projects that were not forecast. How could this man be considered a professional by his manager? He certainly misses the opportunity to sell maintenance to management as a management sphere of activity.

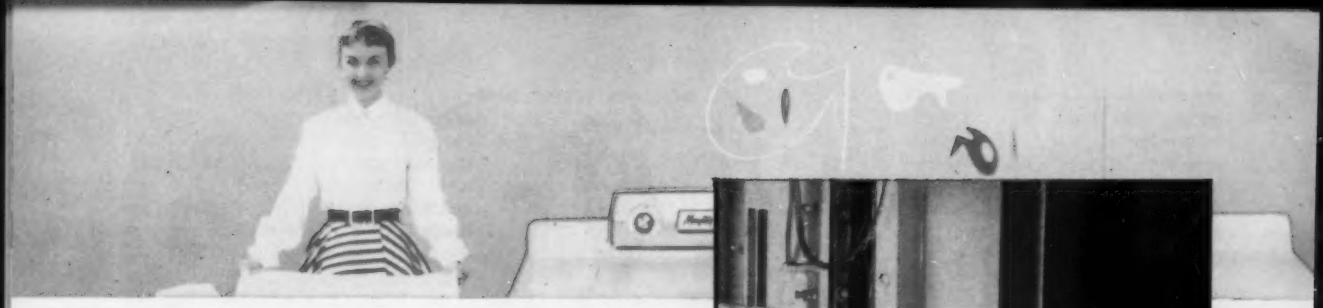
To put yourself in the management category make a realistic study of your main maintenance projects, say over $1,000, for your fiscal year—and the next five fiscal years. You as well as upper management should know where you are going — but you especially should know.

"East is East and West is West and never the twain shall meet." If ever a quotation was apt, this one is as it pertains to the relationship of the maintenance engineering department and the accounting department.

The accounting department does not understand us—but how much more is it true that we do not understand the accounting department. They out-

rank you in the management hierarchy because theirs is the language of management. The terms of management are not valves, trusses, electronics, carbides, kilowatts. The terms of management are profit, costs, depreciation, interest, variable costs, constant costs, inventory control.

To get the professional man's touch,



Maytag switches to STANICOOL HD *Soluble Oil— makes two-way saving*

1 *Cost of soluble oil reduced*

2 *Soluble oil consumption cut two-thirds*

A 300 ton Verson press at the Maytag plant, Newton, Iowa, is used for piercing holes in the inner tubs of Maytag's fine automatic washers. Material used is 18 gauge enameling iron. Holes are pierced in six automatic cycles. A total of 936—3/16 inch holes and 6—19/32 inch holes are incised in each tub.

A check of manufacturing costs on the tubs disclosed that the cost of soluble oil per unit produced was too high. Standard Oil lubrication specialist J. I. Nelson, working with plant management suggested a switch to STANICOOL HD Soluble Oil. The switch was made and Maytag received the first part of its two-way saving: the cost of soluble oil per gallon was reduced. Then it was found that the same high quality product could be turned out, without loss of tool life, while spraying only every third tub. Formerly *each* tub was sprayed with soluble oil before punching. With STANICOOL HD, soluble oil consumption was reduced two thirds. And thus, Maytag received part two of its two-way saving.

Perhaps STANICOOL HD Soluble Oil can help you make similar savings. Find out. Call your nearby Standard Oil office in any of the Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Dwight Norton (right) a Maytag plant foreman inspects automatic washer inner tub with Jesse I. Nelson, Standard Oil lubrication specialist. Jesse Nelson is well qualified to provide lubrication technical service. He has a B.S. degree in engineering from the University of Iowa and has completed the Standard Oil Sales Engineering School. Jesse has been helping customers with lubrication problems for more than three years. Customers find his experience and training pay off for *them*.

STANDARD

STANDARD OIL COMPANY
(Indiana)

For more facts circle 568 on Reply Card

Quick facts about

STANICOOL HD Soluble Oil

- Emulsifies readily with all waters.
- Forms stable, uniform emulsion.
- Does not turn rancid.
- Non-injurious to men, machines and work.
- Economical. Meets work requirements with relatively low emulsion concentrations.
- Prevents rusting of work and machines.
- Gives better tool life.
- Doesn't form gum on machines.

you will have to know his speaking terms. You must have an intimate knowledge of your plant's accounting procedure if you want to become a top professional man.

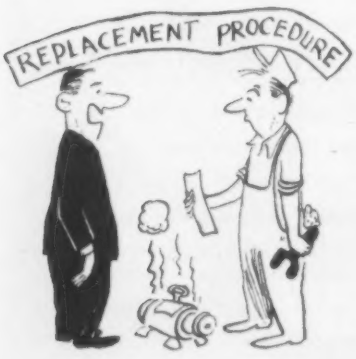
If you want to sell maintenance to management—by becoming a part of management—you will have to act like the rest of management. Act like an executive! You are one! If you do not carry the feeling of being a part of the top group you are not fulfilling your position in industry. You were given a department to run. Run it. Don't be tied to the apron strings of indecision. As much as possible save your manager as many contacts as you can—don't be running to him for advice for every problem that arises. Settle them yourself. He will appreciate it and besides that, that is what you are being paid to do. You have the job—perform it. The true management man runs his department.

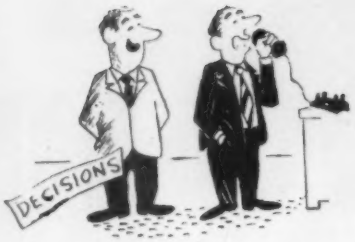
Be Part of the Plant Team

As an executive—a true management man—you have the number one responsibility of developing your own organization. You can only act through the people you manage and it is by their effectiveness that you are judged. Prune out the weak sisters. Get the men on the job who are competent and loyal. Expect performance.

As an executive you will acquire a familiarity with other departments. Get out of the provincial frame of mind that characterizes submanagement personnel—that your department is the most important one in the plant. Get the broad picture—loose yourself from details that mire your mind and your activities. Work with the purchasing department and production department. They may know a few things about engineering and maintenance—believe me their knowledge is sometimes a great help. Be a part of the plant team—that is the management attitude. Remember that plant engineering is an important part of your plant—but only a part.

Another mark of the professional





Plant Engineer is the use of a progressive modern equipment replacement procedure. There are a number of good methods—undoubtedly many of you have your own. One method coming strongly to the front is the MAPI (Machinery and Allied Products Institute) accounting method. As men whose primary interest is maintaining plant facilities, you should be vitally interested in seeing that your annual maintenance and obsolescence factors do not outweigh the expected annual return on investment. Many of us become aware of this only in extreme cases.

Assuming you operate on a return-on-investment basis—can you afford not to replace your equipment? How do you know? Again, this is a good spot to reiterate the close tie-in of maintenance and plant engineering—it's almost impossible to separate them. Are you replacing equipment by using "judgment"? Are you aware that there is an accurate method for determining when equipment should be replaced? The modern Plant Engineer is effectively using this method as a tool.

Use Modern Maintenance Methods

Do you wish to be considered a professional man—to raise maintenance engineering to the niche to which it belongs? Just take some $5,000 maintenance project and apply MAPI to it and submit it to your manager. He will be tickled pink because MAPI is an established concept. It certainly beats the old table thumping demands for maintenance work at the threat of a breakdown. Such practices are part of the reason why management has tended to consider maintenance on a sub policy level—just because a project could not be presented on a business-like level. In addition to the effect on your manager—your vice president and board of directors will be impressed and more easily sold. Most important, though, is the fact that you too will appreciate this professional approach.

The most effective manner of selling maintenance as a management function and to give it respectability is by organizing your maintenance work. Too often the maintenance engineer is run by his work. He will never attain management status—and indeed he shouldn't—if his day's activities are governed by burned out motors, stuck valves, loose guides and dry bearings. It is only too obvious that this type of maintenance manages the maintenance department—not vice versa.

The Plant Engineer who has his maintenance work organized and scheduled, with allowances for emergencies, is the man who is running his job and not being run by his work.

Just remember this rule—be like other management men—organize your staff, your men, and your work so they effectively complement each other. You be the boss! Run your work—don't have your work run you.

To do a little recapitulating. Why all this talk on broad policy—management matters? Because the most effective manner of selling an effective maintenance program is exactly the same as the manner of selling any maintenance project to management. The battle is half won when you have your rightful spot in the management group. How do you acquire this spot? Performance you have always had. Loyalty you have given. Essential to the welfare of the plant you always have been. What is yet needed to seat you around the polished table? Just a few things:

(1) Sell maintenance by word as well as by deed.
(2) Use an effective maintenance forecast.
(3) Be smart—join up with the accountants.
(4) Act like an executive.
(5) Use modern replacement techniques.
(6) Run your work—don't let your work run you.

The second part of this article will tell how you can sell yourself to management and, as a result, sell maintenance. It will deal with the Plant Engineer's relation with his manager, with other department heads, and with the men in his own department.

Modernization

with new glass block sash replacement,
Barton Candy Company, Brooklyn, New York.

BEFORE

AFTER

In this extensive remodeling at Barton Inc., more than 10,000 eight-inch and 4,400 twelve-inch glass block were used in sash replacement. Architect: Tobias Goldstone. Contractor: Apco Construction Company. Both of Brooklyn, New York.

"Modernization with Owens-Illinois Glass Block brought us a host of working advantages."

Nathaniel R. Kaplan
Vice President, Barton Inc.

"Owens-Illinois Glass Block have assured our privacy and given our plant durable beauty.

"In the Confectionery Industry," continues Mr. Kaplan, "insulation against heat, absolute cleanliness, and well-diffused lighting are prime essential building requirements . . .

". . . Owens-Illinois Glass Block have lived up to these specifications."

In any plant or office, the first thing you notice with glass block panels is softer, better light. From early morning until late afternoon, daylight spreads evenly over the entire room . . . even to areas far removed from the panels.

Then, a second advantage becomes apparent. Heating and air conditioning systems work far more efficiently! Thanks to the greater insulating properties of glass block, closer control of room temperatures is easier to maintain. And, since Owens-Illinois Glass Block are extremely difficult to break, there's virtually no maintenance . . . and no replacement of window frames and sashes.

If you are in the process of remodeling an old structure or building a new one, don't overlook the positive advantages that panels of Owens-Illinois Glass Block bring. For additional information write Kimble Glass Company, subsidiary of Owens-Illinois, Dept. PE-6, Toledo 1, Ohio.

OWENS-ILLINOIS GLASS BLOCK
AN (O) PRODUCT

For more facts circle 569 on Reply Card

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

An informal dinner meeting was attended by plant engineers in the industrial area of Valley Forge to discuss the formation of a Plant Engineers' society for the area. Bob Hiller, President of the AIPE, was on hand to answer any questions

Plant Engineers' Society Formed in the Valley Forge Area

ON APRIL 16, 1956, plant engineers from the Valley Forge area held an informal dinner meeting at the William Penn Inn, Gwynedd, Pennsylvania, to discuss the formation of a plant engineers' society for the Valley Forge area.

Bob Hiller, Plant Engineer, Dravo Corp., Pittsburgh, Pa., and President of the AIPE, was on hand to answer any questions the men might have about the other plant engineers' societies that have been organized and about the national organization, the American Institute of Plant Engineers.

John Waligora, Chief Engineer, Sharp & Dohme, Div. of Merck & Co., Inc., and a member of the Greater Philadelphia Plant Engineers' Club, was also available to explain the activities of the Philadelphia Club.

Kits containing information about other plant engineers' societies, suggestions for organizing a society and sample constitutions were distributed by Rocky Marinello, of PLANT ENGINEERING magazine.

A question-and-answer period followed the dinner and each of the potential members had an opportunity to ask questions. After this general discussion, each man was asked to express his views. Phil Damm, of the West Point plant of Sharp & Dohme, Div. of Merck & Co., Inc., mentioned that he had attended several meetings at the Greater Philadelphia Plant Engineers' Club and felt that he could get a lot of helpful information from such an organization. Remarks from the other men were also favorable and a motion was made and seconded that the group organize the Valley Forge Plant Engineers' Society.

Names of Attendees

Those in attendance and identified in the picture above are:

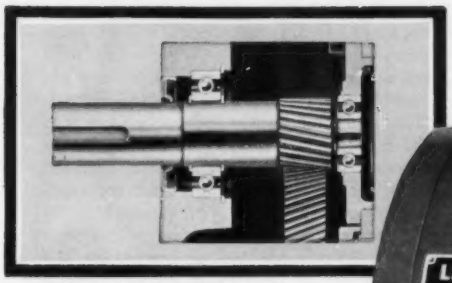
Standing, left to right: J. Lundelius, Superior Tube Co., Collegeville, Pa.; P. G. Damm, Sharp & Dohme, Div. of Merck & Co., Inc., West Point, Pa.; P. A. Repino, Lebanon Steel Foundry, Lebanon, Pa.; J. Waligora, Sharp & Dohme, Div. of Merck & Co., Inc., Philadelphia, Pa.; W. Hoffman, Lansdale Tube Co., Lansdale, Pa.; W. B. Tice, Perfect Foods Co., Lansdale, Pa.; C. Johnston, Lansdale Tube Co., Lansdale, Pa.; R. L. Marinello, PLANT ENGINEERING magazine; H. Blagrove, Leeds & Northrup Co., North Wales, Pa.; and L. L. Fisher, American Encaustic Tile Co., Inc., Lansdale, Pa.

Seated, left to right: G. Russell, American Chemical Paint Co., Ambler, Pa.; R. W. Hiller, President of the AIPE, and Plant Engineer at Dravo Corp., Pittsburgh, Pa.; P. Noreen, Link-Belt Co., Colmar, Pa.; W. Knapp, Adam Scheidt Brewing Co., Norristown, Pa.; and H. I. Hess, Keasbey & Mattison Co., Ambler, Pa.

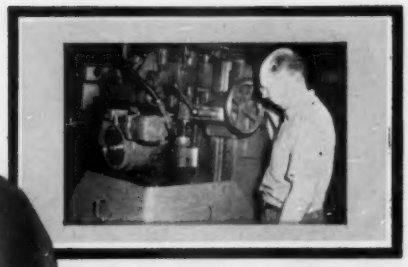
Phil Damm was appointed temporary chairman until the group holds its general election of officers. He will also serve as chairman of the Constitution Committee with assistance from P. Repino, J. Lundelius, C. Johnston and G. Russell. They plan to hold future meetings on the third Monday of the month.

The Constitution Committee will review the sample constitutions and prepare an outline for their own constitution for discussion at their next meeting.

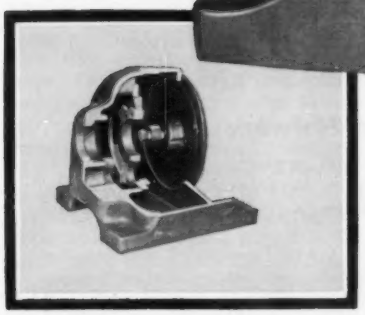
From Link-Belt . . . NEW, precision-made In-Line Helical Gear Drives



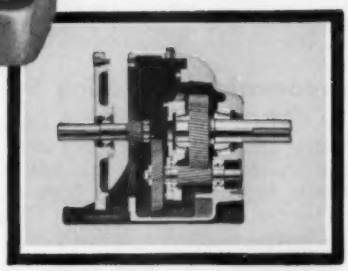
RIGIDITY of high speed shaft and pinion is provided by straddle-mounting—of extreme importance in coping with shock, reversing and heavy loads.



HARDENED GEARS are produced on modern hobbers and are accurately shaved. This provides the ultimate in gear performance.



OIL-TIGHT DESIGN is provided by one-piece, close-grained cast iron housing with effective oil seals.



ONE LOW-SPEED GEAR SET per drive size and maximum accessibility of all operating parts simplifies maintenance.

WHEREVER you need dependable speed reduction up to 118 hp . . . and strength and long life are major factors — new Link-Belt In-Line Helical Gear Drives are specifically equipped for the job. In their smooth, corrosion-resistant, husky cast iron housing . . . hardened, precision, double or triple reduction gear sets accurately provide required speed.

Space requirements and layout problems are minimized by locating input and output shafts in the same horizontal and vertical planes. Design of drive permits the addition of integral, positive-locking backstop at any time.

Get the full story on these advanced new drives, ratios 6.2:1 to 292:1, in 16-page Book 2651. It's available from your nearby Link-Belt office or authorized stock-carrying distributor.

LINK-BELT

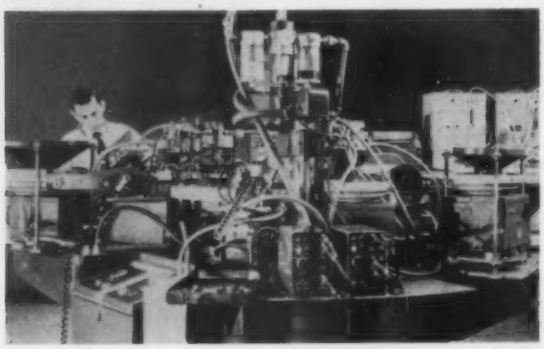
ENCLOSED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,098

For more facts circle 570 on Reply Card

Automatic Machine Builds a Mercury Battery—And Rejects Its Mistakes

MULTI-PURPOSE as well as automatic, a new assembly machine called the Multra is turning out more than 15,000 mercury batteries every 8 hours on a production basis for P. R. Mallory & Co., Inc.



Designed and built by the Multra Corp., a subsidiary of Barnes Engineering Co., Stamford, Conn., the machine automatically performs all the functions of battery assembly operation. It feeds, sorts, sizes, forms, orients and inspects five different battery parts — these parts including such forms and materials as metal cylinders and caps, felt absorbent, neoprene grommets, pressed metal and a liquid electrolyte that the machine also meters into the battery assembly.

Characteristic of true automation systems, Multra features a feedback system; if a part should fail to be inserted at one of the stations, then the sub-assembly with the missing part is rejected at a later station, but, meanwhile, no further parts are fed into it.

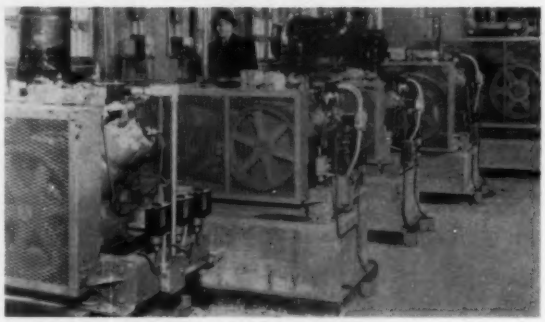
With facilities to do 16 separate tooling operations, the machine weighs over 7,000 lb. Parts are fed from work nests located around the machine at work stations.

Close Control on Refrigeration Brings Close Control of Hospital Storage Rooms

IN THE VAST KITCHEN and storehouse that will serve the new Manhattan State Hospital on Ward's Island in New York's East River, refrigeration innovations make it one of the country's most interesting installations.

The 320-ft by 80-ft building, 3 stories high, has five low temperature rooms, to be maintained at temperatures of 10 F and —20 F, and 25 walk-in refrigerators. Two compressors, a 30-hp and a 20-hp, serve to control all five of the deep-freeze rooms.

The defrost operation will be automatically controlled on each compressor by a Tork Switchmaster time switch, manufactured by the Tork Clock Co. Defrost cycles ranging from 2 to 55 minutes, accurate to any one minute period adjustment, are possible with the system.

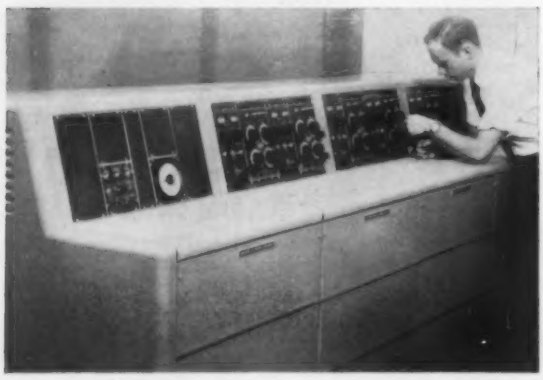


In all, six compressors are to be used in the building. In addition to the two for the deep-freeze rooms, there are units controlling an ice cream machine, a flake ice machine and two 75-hp compressors for the brine system used in the 25 walk-in refrigerator rooms.

Automatic Dispatching System Regulates Power Generation Network

AN AUTOMATIC DISPATCHING system that performs the routine and repetitive functions of electric utility production departments, and automatically adjusts power generation to fluctuating customer demand, has been announced by General Electric's Instrument Department.

The system consists basically of a remote-position repeating selsyn circuit with a single control channel to each generating station in the network. It adjusts total generation to maintain average conditions of frequency and tie-line load.



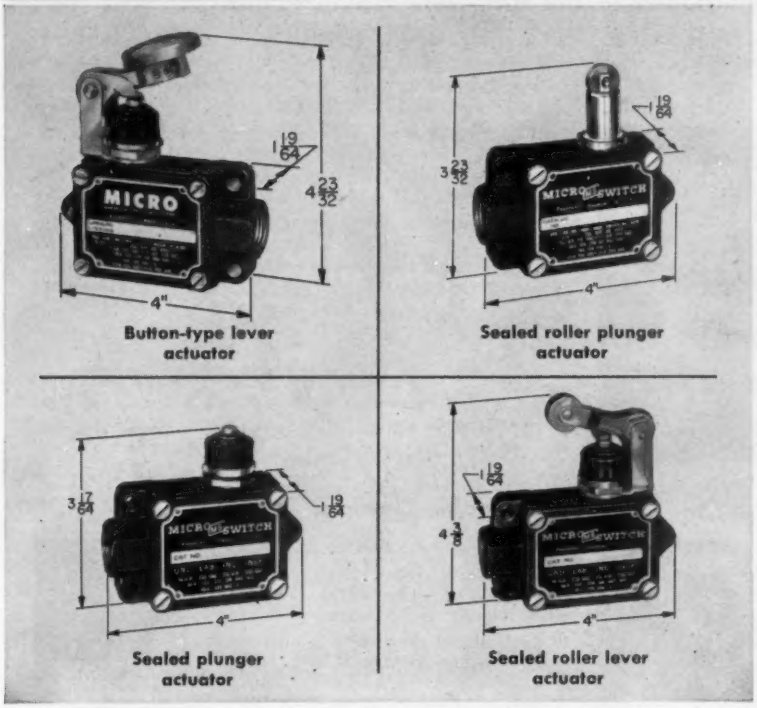
Based on a continuous use of incremental cost data for every machine, the system allocates total generation between machines automatically, to realize a minimum fuel input to the system. The system production cost, in mills per kwh, is compared with this incremental cost data for each machine, to specify a value of output.

The dispatching system is composed of four console sections: master area; dispatching; master station; turbine control console.

The master area section contains all controls for determining the mode of operation for the system as a whole; the dispatching section contains all controls for inserting transmission-loss penalty factors and means for providing signals for the wire line, carrier or microwave channel to each station; the master station section has all controls for determining the mode of operation of the station as a whole; the turbine control section has all controls for determining the mode of operation of individual turbines and for inserting complete incremental cost data.

MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN



High-Capacity enclosed switches for plant applications with heavy electrical loads

Many plant applications call for installation of switches which have more than average electrical capacity. MICRO SWITCH high-capacity enclosed switches meet this requirement with the capacity to make and break steady state currents of 20 amperes, 125, 250, or 460 volts a-c. They will handle inrush currents as high as 75 amperes — switch 10 amperes 125 volts when controlling tungsten filament lamp loads on a-c circuits.

All the types shown are available for either right- or left-hand mounting. They are widely used on present plant equipment as safeties, limits, and interlocks.

Button-type lever actuator: This actuator can be adjusted horizontally through 360° and vertically through 225°. The actuator is sealed with an elastomer (neoprene) boot. The switch is for manual operation.

Sealed plunger actuator: An elastomer boot covers the operating plunger and a ring gasket seals the cover. Die-cast aluminum enclosure protects the basic switch from vibration and shock.

Sealed roller plunger actuator: For cam or slide operation in applications where the approach of the actuating device is not parallel to the switch. Roller plunger assembly adjustable through 360°. Seals prevent entrance of dust, dirt, or moisture.

Sealed roller lever actuator: Well adapted to operation by any type of operation—straight line or cam. Roller lever can be locked in any position at intervals of .2 degrees within a range of 225°. Entire roller bracket can be rotated horizontally through 360° and tightened down in any position.

These switches are typical of a wide variety of MICRO precision switches which have proved successful in making existing machinery safer, more automatic, and more productive.

Basic Switch is Replaceable

The basic switch can be easily replaced, if necessary, without removing the enclosure from its mounting. Ample wiring space within the enclosure and the side facing terminals of the basic switch simplify wiring.

Underwriters' Laboratories Listing

1 H.P. 115 volts a-c

2 H.P. 230 volts a-c

20 amperes 125, 250, or 460 volts a-c

½ ampere 125 volts d-c

¼ ampere 250 volts d-c

Send for Catalog 101 "Switches for Industry"

MICRO precision switches are carried in stock by distributors in every key city. Look under "Switches, Electric" in the Yellow Pages.

MICRO SWITCH

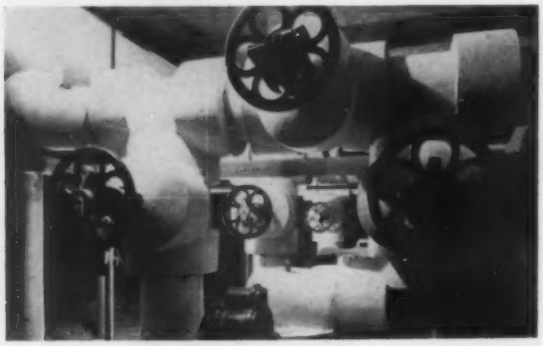
A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

For more facts circle 571 on Reply Card

New York's Coliseum Air-Conditioned to the Hilt—with Piping to Match

BEHIND THE SCENES in the New York City Coliseum, newly-built structure with a triple function—exhibition, office and parking—is an outstanding air-conditioning job.



Over 100,000 ft of pre-designed piping and some 6,000 globe, check and gate valves of all descriptions, ranging in size from ⅜ in. to 20 in., were installed in the heating and air conditioning system. All the valves were supplied by the Reading-Pratt & Cady Div. of American Chain & Cable Co.

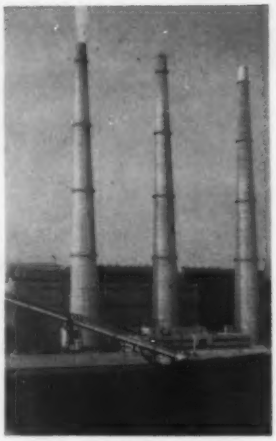
Air conditioning for the office building and exhibit halls uses 1500 tons and 2500 tons of refrigeration, respectively.

The 100,000-plus feet of piping carry steam from the main steam headers and chilled water from the four compressors. All steam, purchased from the New York Steam Corp., is delivered to the meters at 125 to 150 psi, and pressure reducers in the meter room reduce a predetermined amount of this incoming steam to 50 psi and 5 psi, for distribution throughout the buildings.

A 10-in., 125 psi steam main is brought from the steam meter to the compressor main for connection to the four steam turbines which drive centrifugal compressors for the refrigerating systems.

Three Tall Ones in Ohio

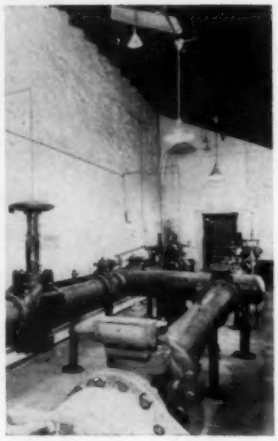
Taller than most skyscrapers, three chimneys tower 600 ft above ground at the Ohio Valley Electric Corp.'s plant in Cheshire, Ohio. The $2 million structures were built of reinforced concrete by the M. W. Kellogg Co.



Gas velocity in the chimneys, 120 fps, is the highest ever designed. Seven large rooms, 50 ft in diameter, have been incorporated into the lower sections of the chimneys to house emergency equipment, controls, switchboards, and a water tank.

Gas Leaks Checked Remotely

AN AUTOMATIC regulator station of the Philadelphia Gas Works has a silent watchman to warn of gas leaks in the station.



The station operates itself—weekly, a PGW employee visits the building, only to renew the recording charts. To detect any gas leak in the station, a Combustible Gas Alarm, made by Mine Safety Appliances, Inc., continuously samples the atmosphere in the building. Small cones hung from the ceiling collect samples, which are automatically analyzed.

Stainless Steel Storage Tank Built to Hold Corrosive Ammonium Nitrate

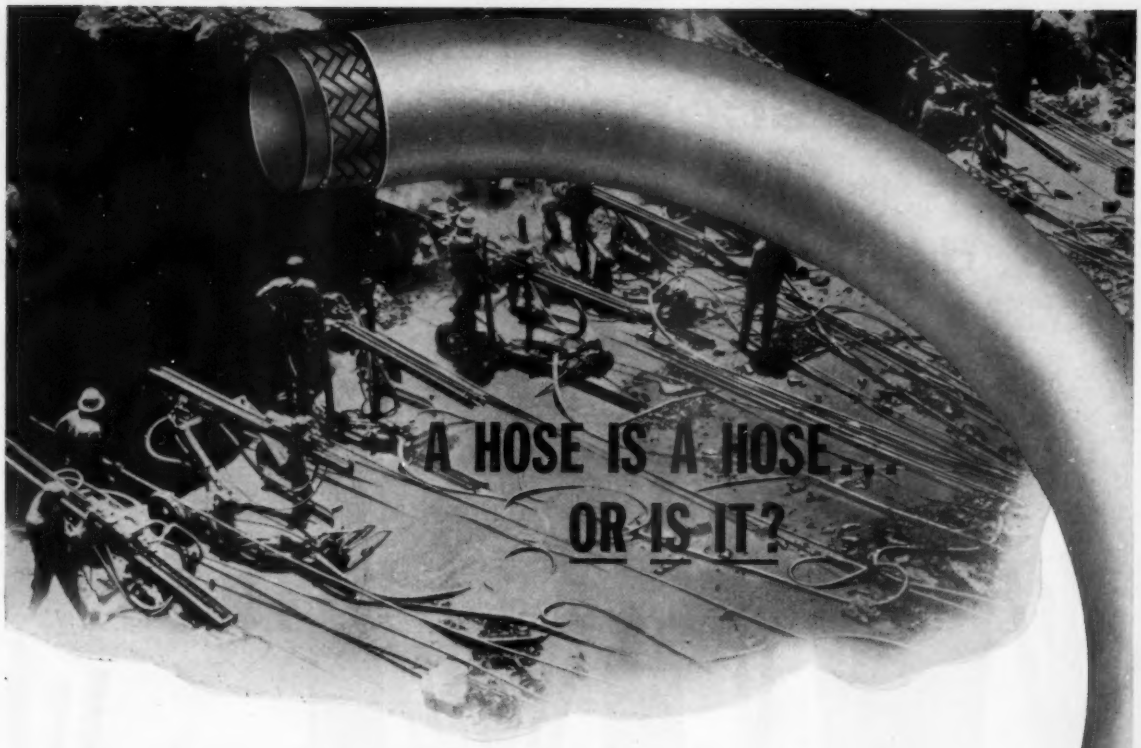
A STAINLESS STEEL storage tank is adding process flexibility to Mississippi Chemical Corp.'s ammonium nitrate prilling plant in Yazoo City, Miss. Built by Chicago Bridge & Iron Company, the tank is 78 ft in diameter and 30 ft high, with a capacity of 25,000 bbl.

Designed basically to store ammonium nitrate in liquid form during periods of partial plant shutdown, the tank can also be used to store nitrate in the off season, for availability in the high demand season.

In the prilling plant, nitric acid is neutralized with anhydrous ammonia to form aqueous ammonium nitrate solution. Further concentrated, the solution is sprayed down through the tall prilling tower, where it solidifies into pellets, or prills.

While the manufacture of both nitric acid and ammonium nitrate solution is relatively simple, corrosion complicates the rest of the process. Frequent shutdown periods are necessary for maintenance, and it is during these periods that the stainless steel tank is pressed into service.

The tank exterior is insulated with foamed glass, and covered with light-gage aluminum sidewalls. The aluminum siding itself resists corrosion from ammonium nitrate to a limited degree—sufficient that some companies have built aluminum storage tanks. However, the possibility of storing nitric acid in the tank at Mississippi Chemical prompted the choice of stainless steel.



A HOSE IS A HOSE... OR IS IT?

DEFINITELY NOT! Different kinds of liquids and gases require different types of rubber tubes. Various pressures demand various kinds and degrees of carcass reinforcement. And many conditions of use call for outer covers able to resist both physical and chemical damage.

No "general purpose" hose is suitable for all the jobs industry calls upon it to do. That's why it is downright dangerous and uneconomical to "borrow" hose purchased for one industrial purpose and adopt it for some other type of service. Invisible but irreparable damage may be done to the hose itself. And unexpected hose failure, due to misuse, may easily result in personal injury, downtime and loss of materials.

NYB&P makes more than 100 different kinds of hose, each specifically built for a definite use. Let your nearby NYB&P Distributor be your guide, as well as your supplier, for every industrial hose requirement. Whether it's air hose, steam hose, fire hose or suction hose, he can supply *exactly* what you need... for maximum safety... greatest ease of handling... and long-run economy. If he is not listed in your classified phone directory, write for his name and address.

NYB&P's Great Seal Wire Braid Air Hose takes highest required pressures, handles easily and resists abrasive punishment of roughest surfaces in mining, quarrying and construction.

NYB&P — NEW YORK BELTING & PACKING CO. Founded 1846

NEW YORK BELTING & PACKING CO. 1 Market St., Passaic, N. J.

America's Oldest Manufacturer of Industrial Rubber Products

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For more facts circle 573 on Reply Card →

More scope for selection

IN THE FULL LINE
OF GENERAL ELECTRIC CABLES

The General Electric line of hundreds of wires, cables, and cords covers just about every possible need. Typical of these are flame-resistant, heat-, moisture-, and weather-resistant types and special constructions to withstand vibration, the electrostatic effects of adjacent power cables—even the effects of atomic radiation. Thus, G-E engineers are never limited to one cable, cord, or wire for a given job but can suggest the most efficient and economical solution for the particular situation.

This is one of the important reasons why General Electric wire and cable engineers have been able to help many electric utilities and industrial customers with their electrical expansion and modernization programs. Another reason is General Electric's knowledge of the requirements of other basic components of power distribution systems—transformers, load centers, switchgear, etc. — and the importance the right wire or cable plays in satisfactory system performance.

All this adds up to experience . . . the kind that can benefit you. Next time you have a cable selection problem it will pay to take advantage of General Electric's knowledge and experience.

For information on your specific wire and cable application or selection problem see the G-E wire and cable specialist in your locality or write to Section W183-664, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

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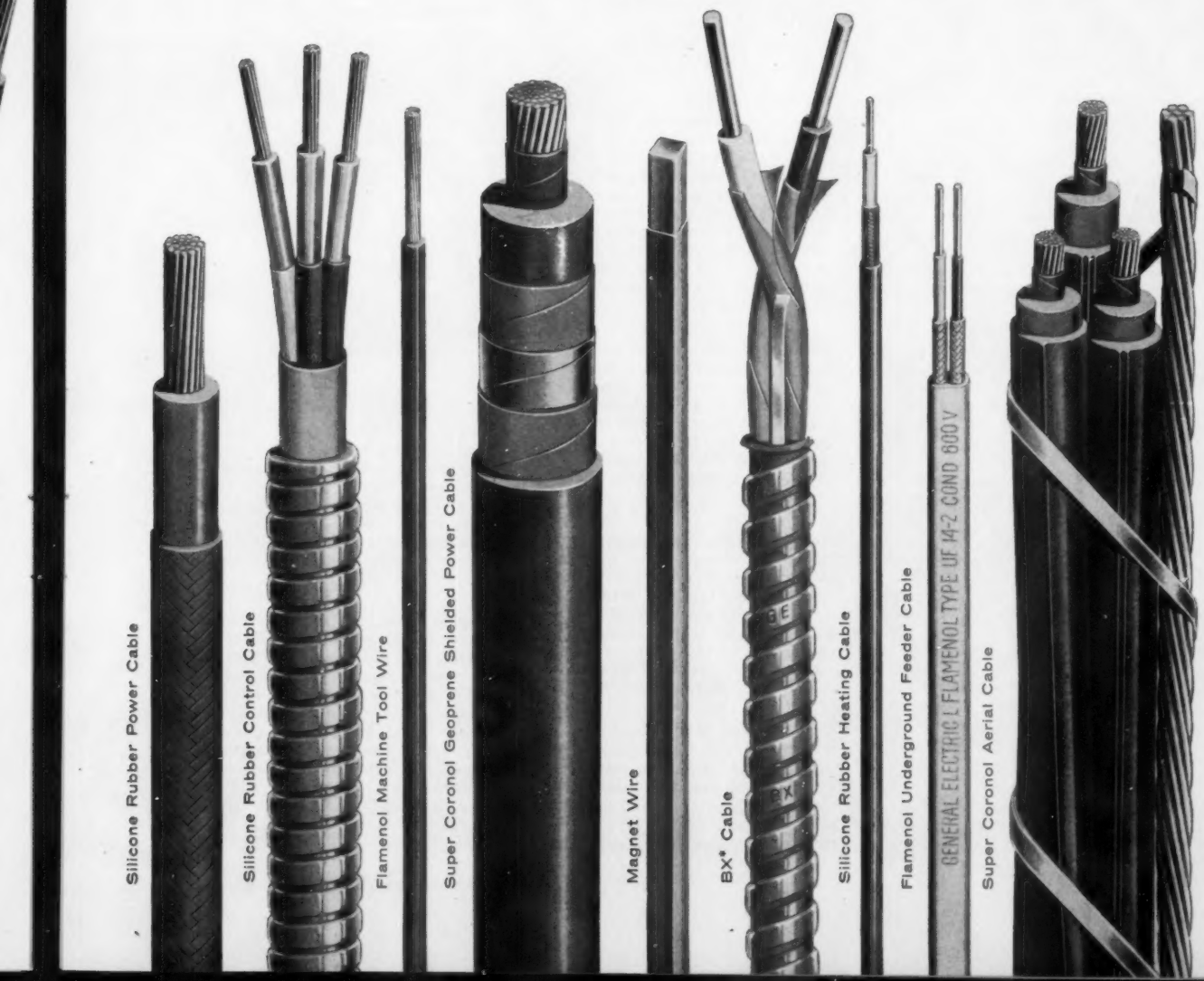
Silicone Rubber Power Cable
Silicone Rubber Control Cable
Flamenol Machine Tool Wire
Super Coronol Geoprene Shielded Power Cable
Magnet Wire
BX* Cable
Silicone Rubber Heating Cable
Flamenol Underground Feeder Cable
GENERAL ELECTRIC FLAMENOL TYPE UF 14-2 COND 600 V
Super Coronol Aerial Cable

NEW PLANT CONSTRUCTION — advance information on location, costs

Pine Bluff, Ark. — The International Paper Co., 220 E. 42nd St., New York, N. Y., has announced plans for immediate construction of a new bleached kraft board mill here, at an estimated cost of $57 million. Production schedule calls for an annual rate of 130,000 tons of newsprint and 165,000 tons of board to start at the end of next year.

Red Bluff, Calif.—The Diamond Match Co., 122 E. 42nd Street, New York, N. Y., has authorized plans for construction of a new integrated forest products manufacturing plant. It will contain facilities for processing lumber, including a saw mill, drying kilns and a planing mill, and a molded pulp plant for producing fiber products with an initial capacity of 30,000 tons annually. Plant is scheduled for completion in the fall of 1958 at a reported investment of $15 million.

San Francisco, Calif. — The General Motors Corp., Detroit, Mich., has plans under consideration for the construction of a new Buick-Oldsmobile-Pontiac assembly plant in the San Francisco-Oakland Bay area. Plant will be a one-story structure with 1.5 million sq ft of floor area and will be in operation in time for shipment of 1958 model cars.

Fort Pierce, Fla. — The Treesweet Products Co., Santa Ana, Calif., and Fort Pierce, Florida, has authorized plans for the construction of new frozen citrus concentrate and cannery plant. Work will get under way at once and will represent an investment of more than $1.4 million.

Marietta, Ga.—The Lockheed Aircraft Corp., 2555 N. Hollywood Way, Burbank, Calif., has plans under consideration for the erection of an advanced design engineering office and research laboratories building at its Georgia division plant located here. Construction of the engineering building will begin in the fall of this year and will represent an investment in excess of $7.5 million.

Chicago, Ill.—The Automatic Electric Co. has announced plans for the construction of a new $16 million plant for the manufacture of telephones, electric relays and switches at Northlake, 15 miles west of Chicago. New plant of 1.3 million sq ft will serve as company headquarters, to centralize and expand company's manufacturing and administrative operations. Plant will be in operation by fall of next year.

Franklin, Ky.—The Kendall Co., 140 Federal St., Boston, Mass., surgical dressings and cotton textiles, plans to construct a new adhesives plant. Plant will expand capacity for production of plastic pressure-sensitive industrial tapes and plastic films, and will have an initial floor area of approximately 35,000 sq ft. Construction will get under way at once and total investment will exceed $1 million.

Baton Rouge, La.—The Esso Standard Oil Co., marketing affiliate of Standard Oil Co. (New Jersey) has plans under way for improving and expanding operating facilities at its Baton Rouge operations. Project will take two years to complete. Included in the $40 million program are facilities for increasing aviation gasoline production; lubricating oil, wax and shipping facilities; improvements to refinery utilities; and equipment for ethylene, butadiene production.

Chalmette, La.—The Kaiser Aluminum & Chemical Corp., Oakland, Calif., has authorized a major expansion of company's primary aluminum reduction plant, by 55 million lb annually. Additional production facilities at the Chalmette plant are scheduled to be in operation by the summer of 1957.

Lake Charles, La. — The Continental Oil Co. has plans to construct a new coking unit, to be owned by the Lake Charles Chemical Co., a newly formed corporation. New facility will operate as an integral part of Conoco's Lake Charles refinery and will be designed to process refinery stocks presently used in the manufacture or processing of heavy fuel oil. Plant will be completed in 1957 at a cost of approximately $6.3 million.

Lincoln, Maine — The Eastern Corp., Bangor, Maine, paper and pulp manufacturer, has authorized plans for the construction of a new bleached kraft pulpwood mill at Lincoln, near Bangor. New mill will have an initial capacity of 175 tons daily and will represent an investment of about $10 million.

Detroit, Mich.—The Briggs Manufacturing Co. has plans to construct a new steel enameling plant, adjoining its new steel forming division which was placed in operation about a year ago. New unit will be so designed to provide a steady flow of material through all operations. Cost of installation will be approximately $7 million.

Grand Rapids, Mich.—Lear, Inc., 3171 S. Bundy Drive, Santa Monica, Calif., flight control systems for aircraft, plans to construct a new manufacturing plant near here. New plant will have a floor area of approximately 175,000 sq ft and is being constructed to free company's present main plant for greater engineering and research activity. New plant will cost $3.5 million.

Laurel, Miss.—The Masonite Corp., Chicago, Ill., has announced a two year expansion program of company facilities for the production of hardboard. Construction work will begin shortly and is designed to boost the capacity of the mill by more than 25 per cent. A budget of $14 million has been scheduled for company expansion and 90 per cent of this figure will be appropriated for work at the Laurel facility.

Purvis, Miss.—The Pontiac Eastern Corp., Corpus Christi, Texas, has authorized plans for the construction of an $18 million oil refinery, three miles north of Purvis and twelve miles from Hattiesburg, Miss. Principal processing units of the refinery are designed to process up to 15,000 bbl daily.

Henderson, Nevada—The National Lead Co. and Allegheny Ludlum Steel Corp. announced plans for expansion of titanium sponge metal production at the jointly owned Titanium Metals Corp. of America, here. New titanium capacity will raise output from 3600 tons annually to better than 6000 tons. Ingot melting facilities will also be expanded to meet increased production.

Linden, N. J.—The General Aniline & Film Corp., 230 Park Ave., New York, N. Y., plans to construct a new ethylene oxide and ethylene glycol plant at its present dyestuff and chemical division plant here. Construction is planned for the fall of this year, with operations scheduled for late 1957. Cost of new project to be in excess of $8 million when completed.

Kingston, N. Y.—The Strelene Realty Corp., a newly organized concern, has announced plans for the construction of a new cement plant. Initial capacity of the new operation is expected to be about 6000 bbl daily with a capacity of better than 9000 bbl a day anticipated within one year. Construction will cost $10 million.

Niagara Falls, N. Y. — The Stauffer Chemical Co., 382 Madison Ave., New York, 17, N. Y., has announced plans for a major expansion and modernization program at its Niagara Falls plant. Company plans to spend about $400,000 for additional facilities to manufacture 73 per cent caustic soda and approximately $150,000 to increase its output of chlorinated solvents. It is anticipated that all work will be completed this year at an expenditure in excess of $1 million.

For more facts circle 575 on Reply Card ——→

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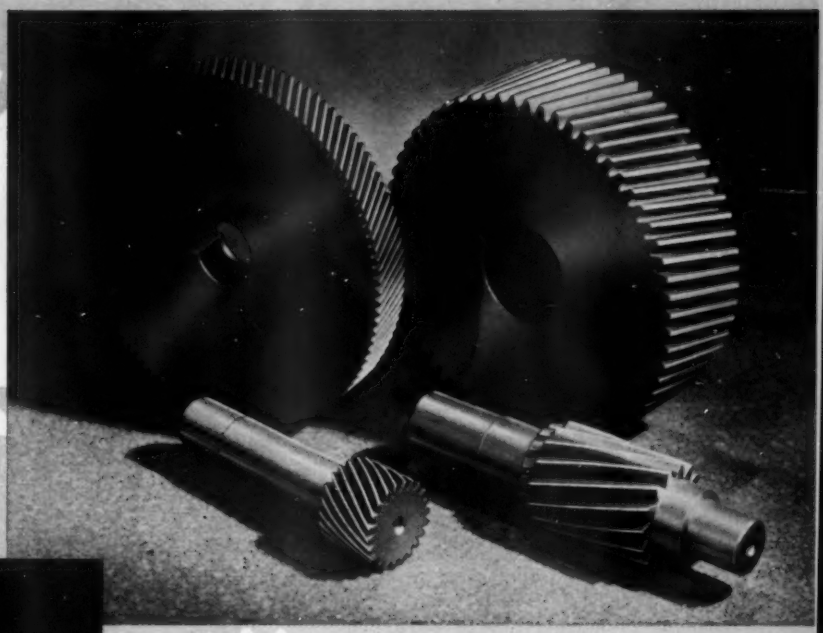
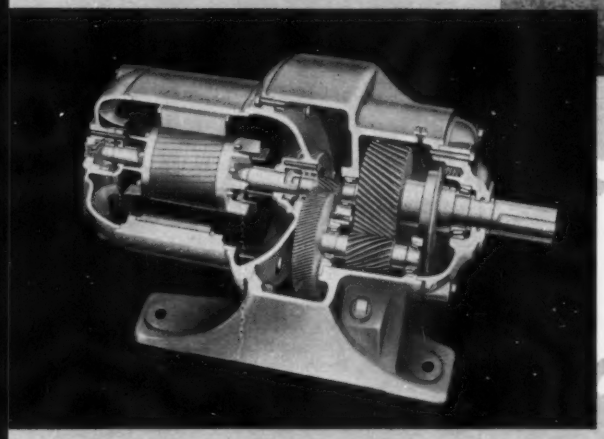
Both Gearing and Motor of the **SYNCROGEAR** are "Custom-built" by **U. S.** to the same high quality





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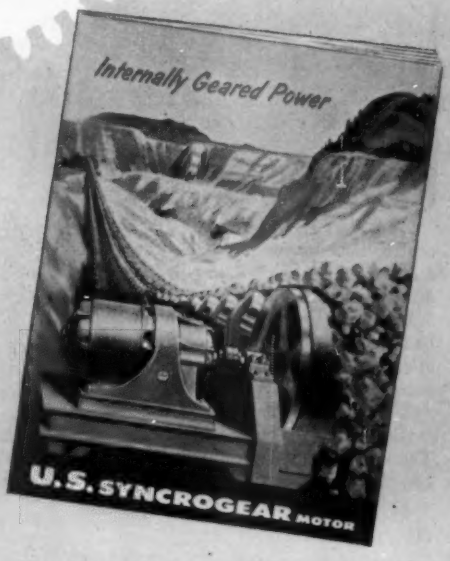
Completely described and illustrated in our new 16-page full-color brochure. Learn about new techniques in gear making for gear motors. In addition to custom-engineered gears, U.S. Syncrogear motors incorporate many other advanced life-lengthening features, including: genuine pyramidal design; completely enclosed case; solid shank ever-tight pinion; friction-free oil seal; asbestos-protected windings; normalized castings and Lubriflush transverse lubrication.



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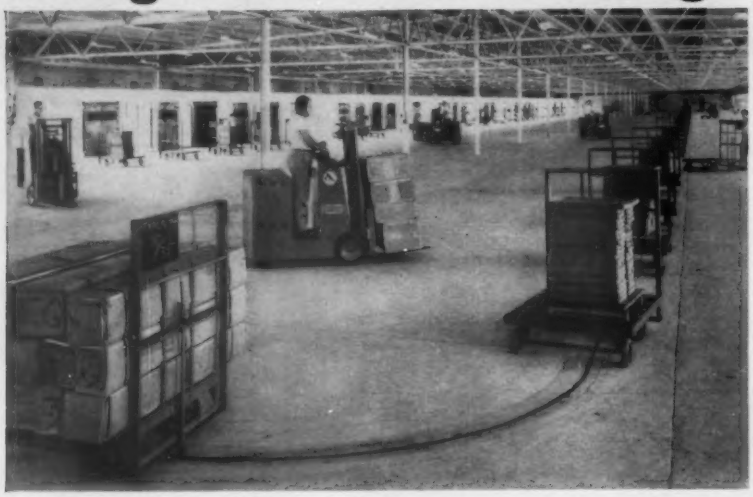
MATERIALS-HANDLING NEWS

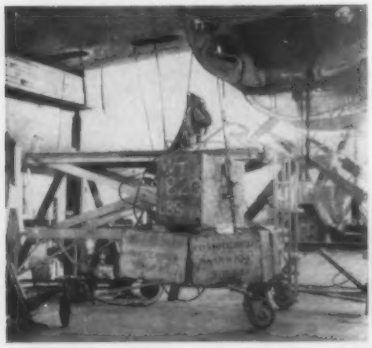
★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

Freight dock—fast handling



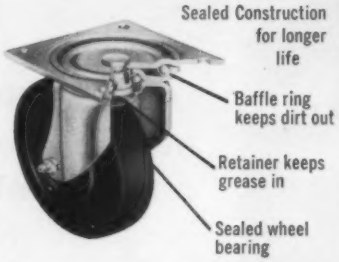
Here's how the freight dock of the McLean Trucking Company of Winston-Salem, N. C., looks at rush hour. Credit for the obvious lack of confusion in handling up to a ton of freight a minute goes to McLean's dragline system—with a healthy assist from Lewis-Shepard trucks and dollies, equipped with Bassick casters.

Stratocruiser in traction cast



Damaged right wing of this Stratocruiser is being warped back into alignment by five 1820-lb. pig iron blocks after an incident in Iceland.

Lockheed Air Service-International had the plane back in action five months after the crack-up. Supplying traction here are the heavy iron blocks on a Bassick-equipped dolly, both of which were made available by local contractors. They're the new Bassick casters with combination swivel and wheel brakes.

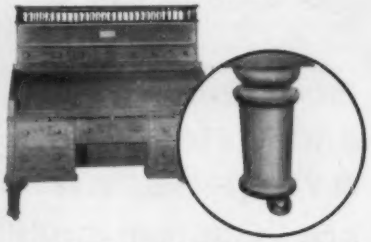


Why Bassick casters? Easy rolling; dependability and Bassick's sealed construction, shown above, that virtually eliminates lubrication maintenance.

Puts maintenance on wheels

Skil Corporation of Chicago, experts in preventive maintenance, have their lubrication problem well under control. By cutting the number of lubricants from 30 to 7, setting up a card file schedule, and using Bassick-equipped lubrication carts, they've practically eliminated lubrication negligence. Rolling easily on Bassick casters, the lubrication cart, above, helps simplify scheduled lubrication of machines and equipment.

The old . . .



George Washington's desk here has to be looked at closely if you want to see the casters it rides on. A close look at your own shipping or production line might uncover a job smooth rolling, easy swivelling, economical Bassick casters could take off your hands.

and the new . . .

The Recording Oscillograph (made by Wm. Miller Instruments, Inc.) and the Bassick "Floating-Hub" casters it moves on in production are both among latest developments in their respective fields. The cathode ray oscillograph is used in studies of rocket structure, jet engines, and supersonic propellers. Spring-controlled Floating-Hub casters not only provide mobility but protect the instruments from shock, vibration.

Materials-handling costs, usually 30% of production costs,are easiest to cut. Your industrial distributor can save you the cost of storing large stocks. He suggests cost-saving methods and equipment. He saves you time in ordering, in emergencies.

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Bridgeport 2, Conn.
In Canada: Belleville, Ont.

see our catalog in Sweet's or write for copy

Bassick
A DIVISION OF STEWART SW WARNER
MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

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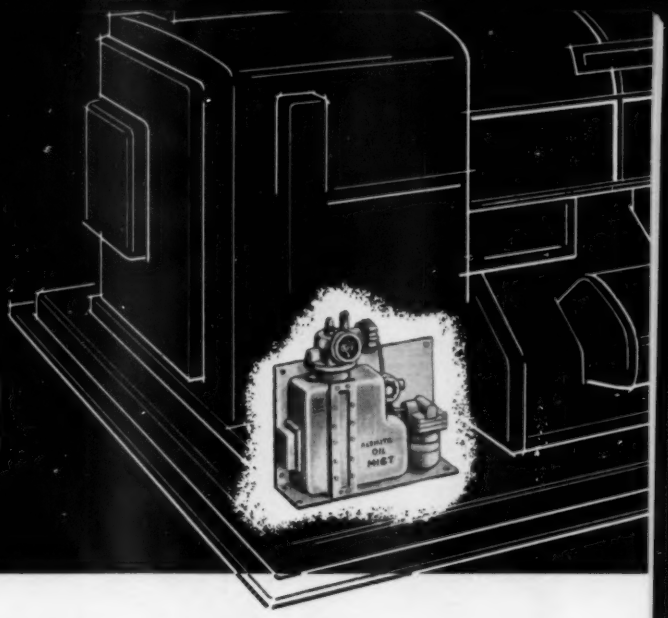
save up to 90% on lubricating costs!



ALEMITE OIL-MIST AUTOMATIC LUBRICATION

multiplies bearing life...cuts product spoilage ...boosts machine output in almost every industry!

Alemite Oil-Mist Automatic Lubrication brings remarkable savings... in lubricants, man-hours, bearing life, and decreased product spoilage.

Alemite Oil-Mist *atomizes* oil into mist—distributes it through tubing to bearings—bathes all bearing surfaces with a cool film of clean oil. Maintains uniform oil film on plain and anti-friction bearings, gears and chains—despite variations in load, temperature or speed. Amazingly simple, continuous and fully automatic... Alemite Oil-Mist eliminates the waste and uncertainties of the "human element" in lubrication.

Let us show you how Alemite Oil-Mist provides more efficient, foolproof lubrication, at lower cost! Mail coupon below for a graphic demonstration!

8 ADVANTAGES
of the ALEMITE OIL-MIST System

1. Continuous Lubrication—Constantly deposits fresh, clean film of oil on all surfaces of all bearings in the system.

2. Fully Automatic Lubrication—Can start and stop with operation of machine switch.

3. Elimination of Guesswork—No bearing can be over-looked, nor over-lubricated! Every bearing picks up only as much Oil-Mist as it needs.

4. Reduction of Bearing Temperatures—Acts as bearing coolant, can lower bearing temperatures as much as 20° F.

5. Reduction of Types of Oil—Reduces number of oils that must be stocked, handled, and applied.

6. Elimination of Downtime—All bearings in the system are constantly lubricated while machines continue to operate.

7. Extension of Bearing Life—Multiplies bearing life many times. Life of grinding machine bearings has been extended from 400 to 7,000 hours!

8. As High As 90% Less Oil Consumption—Alemite Oil-Mist usually consumes about 1/10 the amount consumed by any other oiling method!

Alemite Oil-Mist Lubricates ALL Types of Mechanisms

Anti-friction Bearings | Plain Bearings | Chain | Gear | Gear Cases

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☐ Please have your Alemite Lubrication Representative arrange a no-obligation demonstration.

My Name .....

Title .....

Company .....

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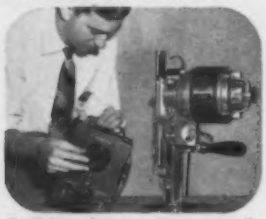
Baltimore Aircoil Company, Inc. — uses Strobotac to measure and control speeds of inaccessible fans and pumps in condensers for air conditioning and refrigeration.

Radmond Company — production testing of small horse-power motors, with aid of Strobotac; each test station handles 250 motors per hour.

American Airlines System — Strobotac at repair shop checks operation of delicate vibrator units; mechanical tachometers proved useless in this application.

Remington Rand — Strobotac at final adjustment-and-inspection station permits visual slow-motion observation of electric shaver mechanical movements.



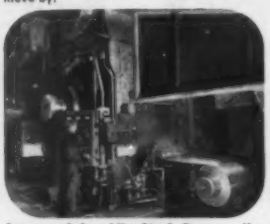
H. Maiman Company, Inc. — uses the Strobotac to great advantage in balancing knife blades, emery stones and other reciprocating components of cloth-cutting machinery and to keep vibrations and oscillations to a minimum.

American Thread Company — Strobotac checks registration of four-color printing press operating at speed of 175 ft/min — permanent installation permits operator to observe accurately printed labels as they move by.

Stanley Electric Tools — Strobotac measures motor speed of electric hammers in relation to oscillations per minute of cutting head — Strobotac is only instrument capable of measuring this motion and does the job without danger to personnel.

Ohio Boxboard Company — Strobotac eliminates blistered cardboard; by examining the molten corrugated medium under stroboscopic light as it "fluffs" out, it is possible to make adjustments to insure uniform adhesion.

Duplan Corporation, Burnsville, North Carolina Division — Strobotac measures rpm of spinning bobbins to insure that tension, twist, size and hardness of packages are uniform. Faulty operation resulting from crooked bobbins, badly positioned or broken flyers, sluggish oil in spindle bolster, and other defects are readily revealed.



Jones and Laughlin Steel Corp. — the Strobotac helps guard against recurring imperfections in steel being rolled at 70 mph; the ratio of slip between top and bottom rolls of a five-stand, four-high Cold Reducing Mill is accurately checked without need for expensive shutdown.

Hydraulic Equipment Center — in design and installation of hydraulic pumps, the quantity of oil pumped per unit time must be carefully controlled; Strobotac provides a highly accurate and easily portable means of correlating the speed of the power unit with amount of oil pumped.

American Bosch Corp. — uses Strobotac for final inspection of diesel fuel-injection nozzles, not only to insure that fuel distribution in each cylinder is accurate, but that the spray has a precise pattern in the combustion chamber — every nozzle is tested and each spray pattern checked against a master-spray chart.

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The Strobotac has countless industrial uses because of its ability to measure speeds of cyclic moving mechanical parts and industrial operations with a *convenience*, *rapidity* and *accuracy* not obtainable with any other equipment. The Strobotac's rate-of-flash is changed by simply turning the main control knob until the cyclic movement appears to "stop". Rpm is then read directly from a calibrated scale to an accuracy of ±1% . . .

The Strobotac permits visual observation of rapidly moving objects as if they were in s-l-o-w motion. Misalignments, worn or broken parts, slipping, vibration, excessive torsion, and other mechanical defects impossible to see with the unaided eye are readily revealed under stroboscopic light.

The Strobotac can help you! It can make measurements which are impossible with mechanical tachometers or any other instrumentation.

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...a glass-lined booster water heater!

Burkay Model B-180—small booster water heater with a *glass-lined* tank for generating sanitizing rinse water for the single tank door type dishwasher.

Input: 50,000 BTU /hr. (45,000 LP & LP air).

Recovery: 42 gal. /hr., 100° F. rise.

Capacity of tank: 8 gal.

Height: 30½", fits under a counter. Diameter: 19".

Controls: Robertshaw-Fulton Unitrol No. 400.

Improved thermal barrier for high efficiency.

A.G.A. approved.

IDEAL FOR: Diners, Fountains, Lunch Counters, Cafes, Grills, Tea Rooms, Taverns, and other medium to small eating places.

Only A. O. Smith can give you such a water heater. The new B-180 has an A. O. Smith glass-lined tank — corrosion-free construction *plus Burkay* ruggedness, efficiency and long life. The B-180 meets your sanitizing hot water needs and provides economical operation.

The new Burkay B-180 was designed specifically for the sanitizing rinse needed in the small restaurant. Now you can easily have the sanitizing rinse water for your dishwashing machine to meet Sanitation Code Requirements.

You can now have 180° F. sanitizing water at low cost. With pre-heated water, the Model B-180 will supply the 180° F. rinse water needed for the single tank intermittent operating dishwashing machine or the hand rinse. Furthermore, it fits easily under the counter . . . takes up a minimum of valuable space. The B-180 costs less to operate—is inexpensive to install . . . easy to maintain . . . operates on all gases. Install it today.

See your A. O. Smith distributor or your gas company.
"Plenty of Hot Water Pays All Ways"

TEAR OUT NOW and MAIL FOR FULL DETAILS

A. O. Smith Corporation
Permaglas Division, Kankakee, Illinois, Dept. PE-656

Gentlemen: Please send me immediately full details on the New Burkay B-180.

Name.....Title.....

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City.....Zone....State.....

Through research ... *a better way*

A.O.Smith
CORPORATION
Permaglas Division, Kankakee, Illinois

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★ *Eliminate Motor Burnouts*
★ *Reduce Production Down Time*
★ *Minimize Motor Repairs and Replacements*
★ *Plus maximum motor capacity under any conditions*

Klixon Protectors in your 3-phase motors, single and dual voltage, are a sure way to keep today's rising operating and replacement costs down.

Built-in as an inherent part by the motor manufacturer, the Klixon Protector saves money and reduces idle machine time by preventing the motor from burning out under the following conditions:

1. Extremely heavy overloads
2. Single phasing
3. Stalling
4. Failure to start
5. Lack of ventilation
6. Increase in ambient temperatures
7. Plugging or reversing duty

This means that you have less equipment shutdowns . . . less motor repairs and replacements.

Klixon 3-phase Motor Protectors are available in four sizes — covering a range of horsepower ratings from fractional up through 7½ hp. (600 V.).

And remember, be sure to get complete motor protection in your single phase motor, too. Specify and use motors with Klixon Inherent Protectors. The additional cost is low . . . the savings high. Write for Bulletin MOPR1 which explains inherent motor protection.

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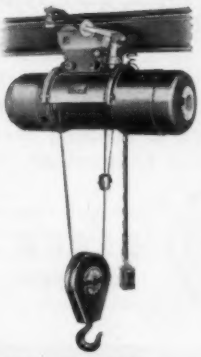
The WRIGHT Hoists for Dependability

3 TOP NOTCH UNITS FOR USE IN LOCAL-BUILT CRANES FOR BETTER JOB AT LOWER COST



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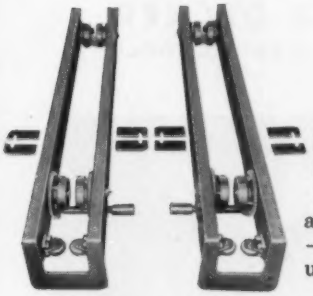
Available in Frame 1, 1½, 2 and 3 sizes with capacities from ¼ ton to 10 tons.



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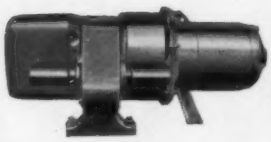
For motor-driven cranes and hand traveling cranes—both top running and under-hung types.

CRANE DRIVE UNIT

Designed for crane and double-beam trolley propulsion. Consists of an electric motor and a well-proportioned gear reduction. Size 1—with motors to 2 HP. Size 2—with 3 to 7½ HP motors.



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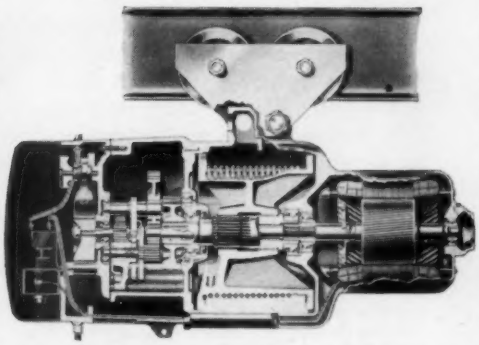
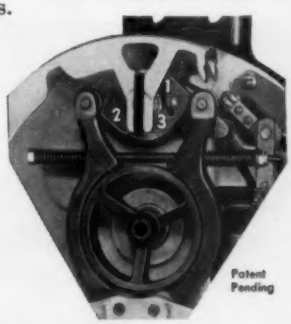
Write our YORK, PA., office

LOOK FOR THESE QUALITY FEATURES



Sound, generous, practical design

Heavy duty design and fine balance assure users that WRIGHT *Speedway* Hoists will handle tough jobs on any duty cycle for which 30-minute NEMA motors are satisfactory. Wide gear faces and novel gear form insure extreme strength. All gears and pinions are alloy steel, heat-treated. Their ductile core supplies shock resistance to sustain service stresses.



Nothing to adjust but the cam!

Adjustment of this cam-actuated brake to compensate for brake lining wear is simple as ABC. When excessive load hook drift occurs...remove the screw shown at Position **1** (*see picture*), swing the cam until Position **2** is in line and replace the screw. That's all there is to it. For the final third of brake lining wear, set the cam at Position **3**. This is the only adjustment required. Brake springs and solenoid never need adjustment.

Better Value

ACCO

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Black & Decker®

electric tools mean low initial cost, low operating cost, more convenience, less noise...and they're

POWER-BUILT TO LAST!

This Black & Decker 7" Standard Sander typifies the power, speed and accuracy of all Black & Decker portable electric tools. It has 20% more power to handle your toughest production jobs—20% less weight to greatly reduce operator fatigue—spiral bevel gears to provide continuous, smooth power—NEW type centrifugal fan to air-cool the commutator. These outstanding features coupled with its ability to sand, grind and wire brush, much faster and easier, make the 7" Sander indispensable to your production output! Your B&D distributor will demonstrate *any* Black & Decker tool or you can write for information to: THE BLACK & DECKER MFG. CO., Dept. 1506, Towson 4, Maryland.

Drills • Screwdrivers • Saws • Hammers • Vacuum Cleaners • Tappers • Polishers • Glue Pot • Grinders—*all* POWER-BUILT to do your jobs faster, better, easier!

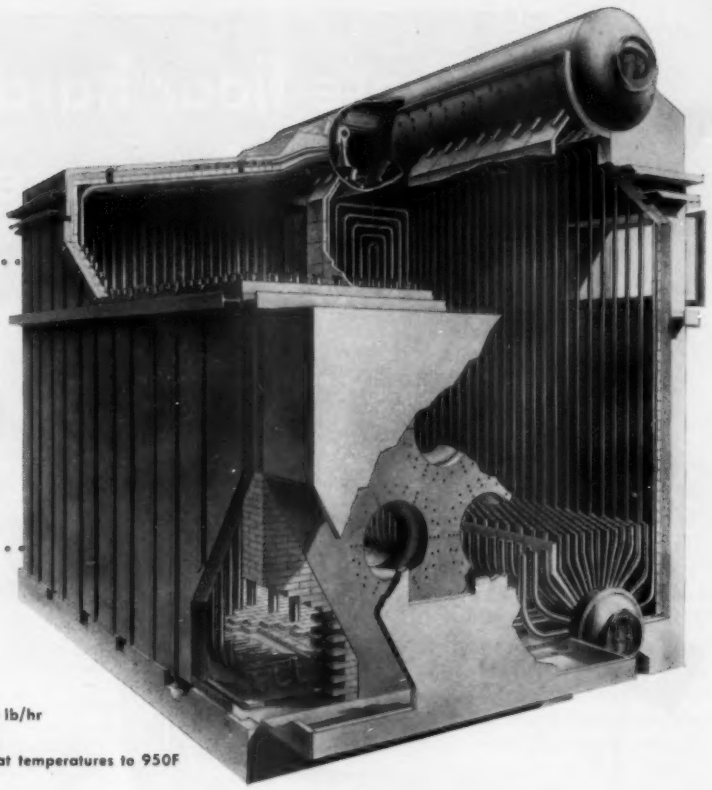
Look in the Yellow Pages under "TOOLS-ELECTRIC"

BLACK & DECKER
PORTABLE ELECTRIC TOOLS

Service . . . . one of 42 Black & Decker factory service branches is located "next door" to you. Staffed by experts to give fast, efficient service, genuine replacement parts.
We don't buy motors– we build them!
The *heart* of your electric tool is the motor—completely built by Black & Decker! All the power you need *and then some*—because each motor is built for a specific tool and the job it must do! B&D motors *stand up!*

For more facts circle 582 on Reply Card

Series "SC" STANDARD Steam Generator



FUELS: Oil or Gas
CAPACITIES: 50,000 to 150,000 lb/hr
STEAM PRESSURES: to 1500 psi
STEAM TEMPERATURES: Superheat temperatures to 950F

PRE-ENGINEERED FOR SAVINGS

in first cost, installation, operation, maintenance

Series "SC" Steam Generator is of the pre-engineered, standardized design, with all exterior and structural details fixed. Available in nine sizes, with capacities of 50,000 to 150,000 lbs steam per hr, it incorporates many advanced design features – as noted in the accompanying list – that make possible important savings in industrial steam costs.

Burners, controls, upper drum mountings and other equipment requiring attention are located at the front of the unit. Heat recovery equipment and fans can be placed near the operating aisle for either single or multi-unit installations, providing unusual accessibility and ease of operation.

Write us today for further information on how the Series "SC" Standard Steam Generator can meet your individual plant needs for power or process work. *Foster Wheeler Corporation, 165 Broadway, New York 6, New York.*

FEATURES AT A GLANCE

- Completely water-cooled furnace
- Over 19-foot firing depth
- Unrestricted circulation
- All-welded casing
- Fully drainable superheater
- Efficient convection surface
- Bottom supported unit
- Steam purifying system
- Full insulation

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

For more facts circle 583 on Reply Card

These floor hardeners give longer life . . . greater safety to your concrete floors

SEND FOR THIS FREE INFORMATION

No matter what conditions are shortening the life of your concrete floors . . . shock and abrasion of heavy loads, chipping and cracking from dropped objects, deterioration from spillage of acids, chemicals or food substances . . . there's a HORN Floor Hardener that's guaranteed to give you better wear and greater safety.

HORN Floor Hardeners can be used on new construction or when patching, resurfacing or relaying worn and eroded floors. They add years of extra wear to concrete floors. Provide non-slip characteristics for greater safety. Write today for complete information.

A Subsidiary of Sun *Chemical Corporation*

HORN

A. C. Horn Co., Inc.

Dept. H18-65, Tenth Street & 44th Avenue, Long Island City 1, N. Y.

DIVISIONS OF SUN CHEMICAL CORPORATION

HORN (paints, maintenance and construction materials, industrial coatings) • **WARWICK** (textile and industrial chemicals) • **WARWICK WAX** (refiners of specialty waxes) • **RUTHERFORD** (lithographic equipment) • **SUN SUPPLY** (lithographic supplies) • **GENERAL PRINTING INK** (Sigmund Ullman • Fuchs & Lang • Eagle • American • Kelly • Chemical Color & Supply Inks) • **MORRILL** (news inks) • **ELECTRO-TECHNICAL PRODUCTS** (coatings and plastics) • **PIGMENTS DIVISION** (pigments for paints, plastics, printing inks of all kinds) • **OVERSEAS DIVISION** (export) • **A. C. HORN COMPANY, LIMITED** (Canada) • **FUCHS & LANG de MEXICO, S. A. de C. V.** • **GENERAL PRINTING INK CORPORATION OF CANADA, LIMITED.**

For more facts circle 584 on Reply Card

Remington Rand

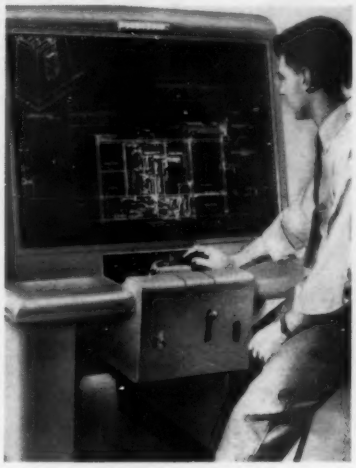
BETTER BUSINESS METHODS

For Greater Profits Through Lower Costs

File and Find Your Engineering Drawings by Photography... Reproduce Them Full Size When Needed

At Lake Erie Engineering Company the problem of filing, finding, and referring to large engineering drawings – long a traditional one in the engineering field – was solved easily and economically with the aid of Remington Rand photocopying techniques.

First, drawings are reduced to microfilm and mounted in Filmsort aperture cards for filing in standard card files. When reference is necessary, aperture cards are viewed on a Filmsort Surveyor, the same as pictured above. To reproduce drawings to full size when needed, a simple enlarging unit exposes the image to Transcopy negative paper and is passed through the 27" Transcopy processor. The result is a faithful reproduction of the original in actual size, prepared easily, quickly, and economically.



Microfilmed images, mounted in aperture cards, are viewed full size on the giant screen of the Filmsort Surveyor.

Photo-reproduction techniques can overcome the awkward and expensive features of filing your drawings. Full details on these new techniques are illustrated in the informative Lake Erie Case History. Circle CH1051 for your FREE copy.

More Usable Drawer Space to File Your Engineering Tracings ...New 10-Drawer Plan Units

Most users of old style, 2", five-drawer units use only one-half of the drawer height. Now Remington Rand gives you MORE USABLE DRAWER SPACE–10 drawers of 1" inside height, in cabinets which take no more space than the old style five-drawer units.

Valuable and bulky engineering tracings require the flexibility and convenience of quick reference, easy filing and removal, and convenient drawer partitioning. The new 10 drawer units have all these features plus many more. For complete information circle LBV703 Rev. 1.

More Blueprints in Less Space ...Filed and Found Quicker with Open Shelf Filing

When you add 9,462 filing inches at a cost reduction of 76.8 percent, that's filing efficiency. Plus, reduce filing and finding time almost 25 percent, you get accessibility that far surpasses conventional type filing. How? With Remington Rand Open Shelf Filing and Terminal Digit System.

These startling facts came to light when the Garrett Corporation's AiResearch Manufacturing Division switched to open shelf filing to gain greater accessibility to 50,000 blueprints. With the change to open shelf filing they converted from a numerical to the Terminal Digit order filing arrangement. The Terminal Digit method offered the flexibility needed to promote GREATER ACCESSIBILITY.

For more detailed information circle CH1030.

For more facts circle 585 on Reply Card

Remington Rand

DIVISION OF SPERRY RAND CORPORATION

Room 1672, 315 Fourth Ave., New York 10

I want the literature circled.

CH1051 CH1030 LBV703 Rev. 1

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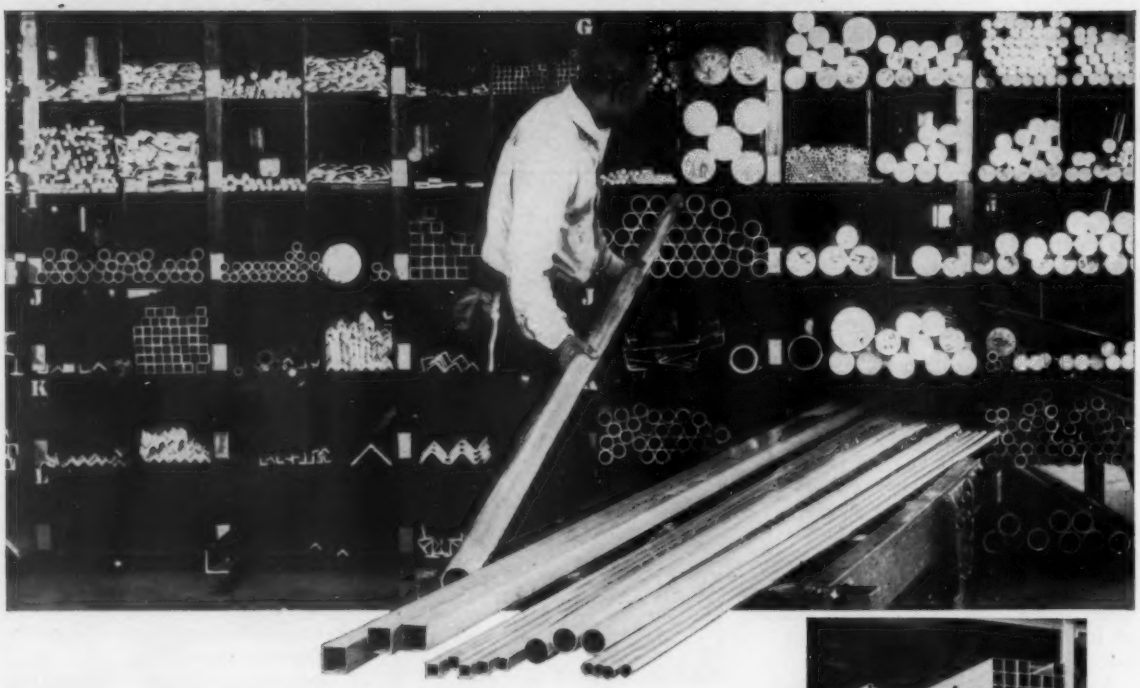
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

1-89



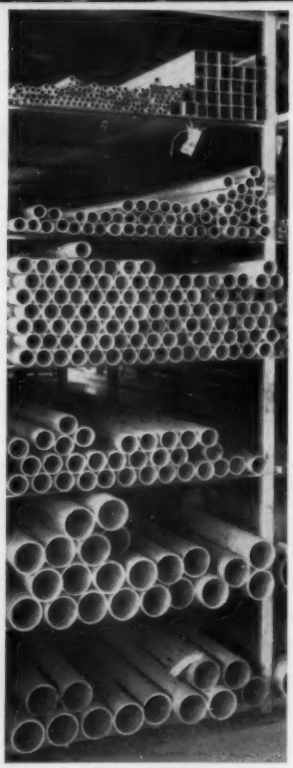
Process piping costs cut 75% with Alcoa Aluminum

When the job calls for corrosion resistance or light weight, look to Alcoa® Aluminum Tube and Pipe. When carrying liquids and gases, material costs can be cut as much as 75% and add still other savings through ease of fabrication and low maintenance requirements. In some heat exchanger and condenser applications, Alcoa Aluminum Tube purchased at less initial cost has outlasted steel by a ratio of two to one. In the process industries, it offers protection against contamination or discoloration of fuel, lubricants and sensitive chemicals.

CAPITALIZE ON LIGHT WEIGHT

So light that you get three times as much footage per pound as with heavy metals. Aluminum tubular products outperform where maximum portability is required. Speed and ease in handling Alcoa Aluminum Pipe cuts costs of portable structures and offers performance economies in gas and air lines on oil field and construction jobs.

Alcoa Aluminum distributors and jobbers carry complete warehouse stocks that include Alcoa® Utilitube; Alcoa® Unitrace; straight tube in round, square and rectangular shapes; standard pipe and fittings; rigid conduit and construction pipe. Get the details from your nearby Alcoa distributor, or write: Aluminum Company of America, 953-F Alcoa Bldg., Pittsburgh 19, Pa.



Your Guide to the Best in Aluminum Value

THE ALCOA HOUR—Television's Finest Live Drama—Alternate Sunday Evenings

Your Alcoa distributor is as close as your telephone.

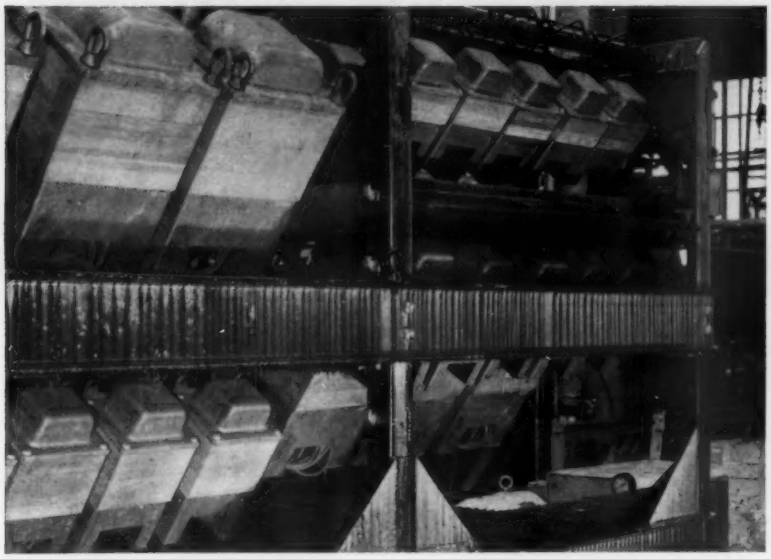
Find Your Alcoa Distributor In The 'Yellow Pages'

ALCOA ALUMINUM MILL PRODUCTS
ALUMINUM COMPANY OF AMERICA

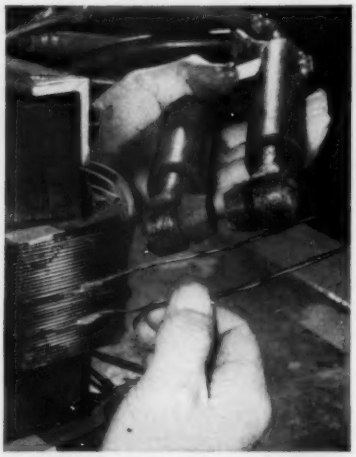
For more facts circle 586 on Reply Card

Dry-Type Transformer NEWS

New Line of G-E Voltage Stabilizing Transformers



Standard design will stabilize a 30% voltage change to 1% nominal within 1½ cycles



G-E voltage stabilizing transformers are tested to find the proper turn ratio on the secondary coil. A tap lead is then brazed to this turn to give positive ±1% turn ratio.

NEW VACUUM IMPREGNATION PROCESS GIVES G-E DRY-TYPE TRANSFORMERS LONGER LIFE

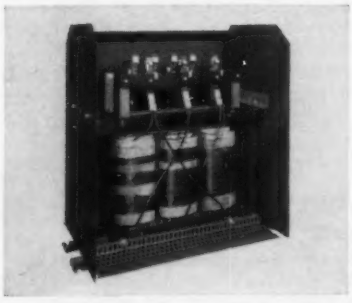
G-E dry-type transformers now give even longer life because the entire core and coil assembly is thoroughly impregnated by an automatically controlled vacuum-pressure process which removes all moisture, gives higher insulation strength and combats corrosive atmospheres. Varnish insulation penetrates the entire unit, and not merely the exposed surfaces. These units available in all standard ratings.

With G-E voltage stabilizing transformers in the circuit, control voltage can be held high enough to prevent relays and solenoids from dropping out under adverse line disturbances. Lightning is a typical example of a disturbance which occurs in most parts of the country. As the lightning charge bleeds off the line through arresters, the line voltage may drop to as low as 30% of normal for a period of approximately 2 to 20 cycles. Properly applied, G-E voltage stabilizing transformers will hold the voltage level up sufficiently to keep the relays locked-in.

G-E voltage stabilizing transformers are available in standard ratings from 15 to 10,000 volt-amperes.

For further information write General Electric Company, Section 410-23, Schenectady 5, New York. Ask for Bulletin GEA-5754.

NEW TYPE D TRANSFORMERS EASY TO CONNECT, SIMPLE TO MAINTAIN



Both the top and sides of the new square case design are easily removed to simplify installation and maintenance. Connections are easily made to solderless connectors in the large, roomy wiring compartment. Thus, as plant power requirements change, G-E Type D transformers can be readily moved to new locations. See your distributor, he has most popular ratings in stock.

GENERAL ELECTRIC

For more facts circle 587 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 227-228.

1—HEAVY-DUTY WAX puts good finish on floors

Ultra Gloss 400 is a liquid floor wax designed for use on asphalt, rubber, vinyl and cork tile, and linoleum. It contains Ludox, a du Pont colloidal silica anti-slip agent to provide safer walking surfaces. Floors protected by Ultra Gloss 400 have a higher coefficient of friction than required by Underwriters' Laboratories, says manufacturer. And even with this safety factor, the new floor coating — made with carnauba wax — gives a long-lasting gloss, it is added. It comes in 1- and 5-gal containers, 55-gal drums. Witco Chemical Co.

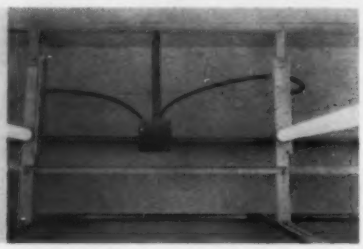
3—HINGED CUTTER for use with brittle pipe

Designed especially for Duriron acid resisting pipe, this four-wheeled hinged cutter comes in five capacities covering the range from 1½- to 12-in. pipe. It is said to assure clean, right-angle cuts as close as 1½ in. to the end without cracking the pipe. Speed is also a feature announced—4-in. diameters of the high silicon iron pipe can be cut in less than a minute. Using same basic design as company's cutter for use on conventional steel and cast iron pipe, this new tool incorporates nickel chrome alloy cutting wheels and a constant-pressure feature. The latter serves to maintain a uniform cutting force, even when pipe is out-of-round or when raised numbers or letters are on the outside of the pipe. This tool is also said to simplify close-quarter cutting of pipe in the line, since it operates with only slightly more than a quarter-circle swing of the handle. Bulletin HD-16 describes the cutter in detail. Reed Mfg. Co.

4—SHEET FLOORING is easy and quick to install

Ready-to-lay flooring, said to be easier and faster to install than any other industrial type, is called Nu-Flor. It goes on in ready-made sheets without mixing, shoveling, tamping and rolling. The material consists of hard, durable preformed sections claimed to outlast concrete, and is manufactured in standard black sheets, 2 by 3 ft in size, and ¼ in. thick. Laid side by side and cemented down with a special adhesive, these sheets form a solid new floor. Traffic can roll over it immediately after application, says company. Nu-Flor is suggested for use over old concrete, wood or steel floors.

Nu-Flor surfaces are reputed to withstand heaviest industrial loads. Other features announced are resiliency, quietness, and freedom from chipping and cracking. Nu-Flor sheets can be cut or shaped with a linoleum knife to fit around projections, pipes. Nu-Flor comes in packages of eight sheets, enough to cover 48 sq ft. The Monroe Co., Inc.



2—ELECTRICAL PACKAGE for installing luminous ceilings

Electra Luminous Ceiling Package simplifies installation and maintenance by combining support frame and light source in one pre-wired and pre-assembled unit. The light-diffusing panels are lightweight corrugated strips of translucent white Bakelite rigid vinyl sheet supported by the pre-assembled unit below fluorescent lights (above left photo). An electrician need supply only enough conduit and wire to connect the unit with switch boxes (above right), it is noted; hollow channels of support frame already contain wiring for the lights. Besides serving as a wire raceway, these extruded aluminum tracks also form a channel to hold the Bakelite rigid vinyl sheet in place, as illustrated below left.

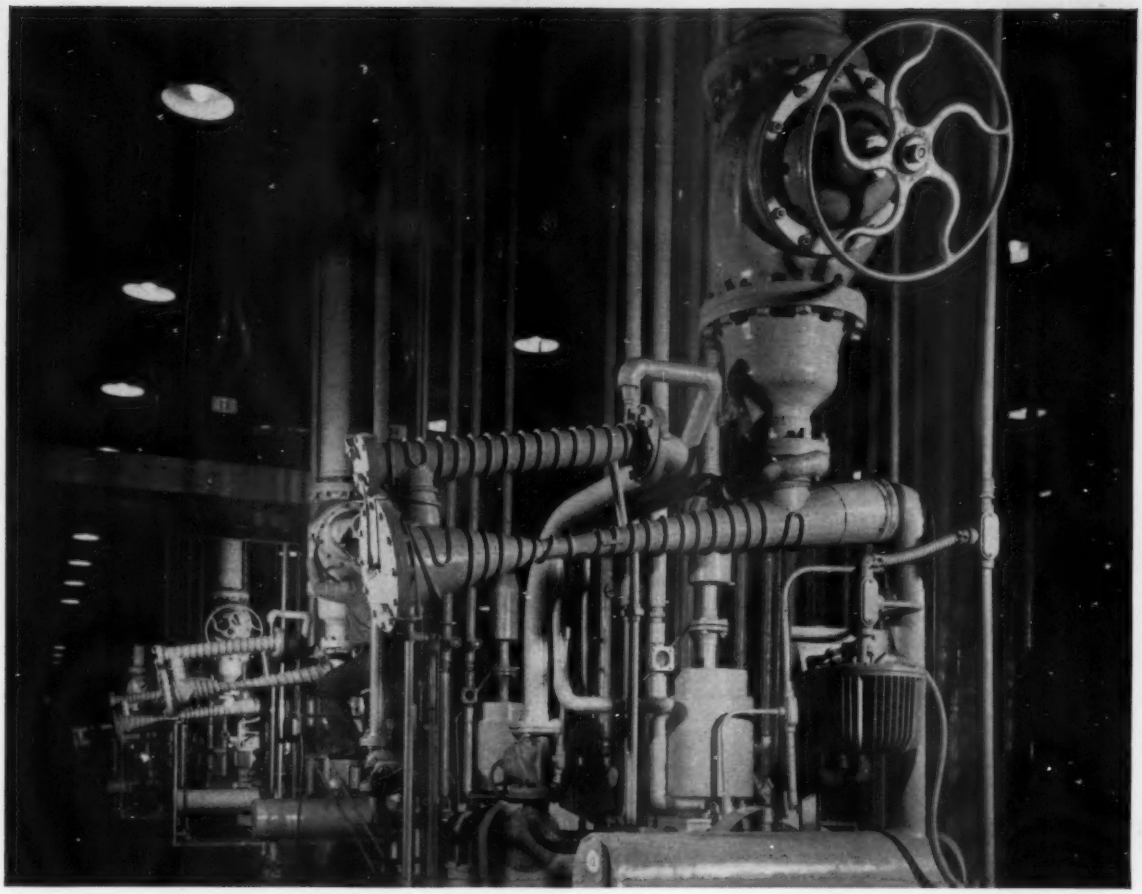
Vertical channels that suspend these tracks from the ceiling also house sockets, wiring and ballast for the fluorescent lamps (below right). Receiving channels to fasten vertical channels to ceiling are flush mounted or suspended by rod hangers. Labor costs are reduced by the pre-assembled units. Supplied in flexible rolls, the corrugated diffusers are reported easy to install or remove for washing. Perforated metal fins containing Fiberglas and designed to attach to the tracks are provided for sound conditioning. Luminous Ceilings, Inc.

5—LAMP STARTER has rugged ceramic condenser

This fluorescent lamp starter has a ceramic condenser described as almost indestructible. Starters with such condensers have an extra long life, limited only by the globottle, according to manufacturer. Ceramic condensers are claimed to stand up under extreme conditions of heat, cold and humidity, and are self-healing on breakdown by high voltage surges. Tests are reported to show that ceramic starter will withstand temperatures of 300 to 500 F for extended periods. The condensers will be used initially in this company's FS-4 and FS-12 fluorescent lamp starters and in all of the 100-w starters. Sylvania Electric Products Inc.

6—DRIVE SYSTEM for synchronized speed changes

The Varidyne is a system of synchronized variable speed, multiple drives. Heart of the system is a power unit which interlocks Varidyne motors by means of electrical impulses, it is explained; turn-



These Crane valves holding 25 microns absolute pressure after 2 years on vacuum service

The Case History—Valves frequently are the most critical points in a vacuum system. But that's not the case with this large Southern light metals refiner.

This plant reports no trouble or expense over a 2-year period in maintaining a vacuum of less than 25 microns absolute for its distillation process.

The tight-holding valves installed about 2 years ago on the lines from vacuum pumps shown above are Crane No. 1611 diaphragm pattern. These 12-in. packless iron body valves are used about once daily.

They've allowed no in-leakage at the seat, bonnet-joint, or through the diaphragm. No maintenance whatever has been given the valves since installed. They operate easily and look good for such service indefinitely.

This high efficiency performance is mainly due to Crane separate disc and diaphragm design. The diaphragm used as a bonnet seal only is not subject to destructive crushing. Conventional type disc and body seat provide a metal-to-Neoprene seating that's ideal for vacuum and hard-to-hold fluids.

Moderately priced, Crane diaphragm valves deserve your consideration for many ordinary services, as well as sludges, slurries and corrosive fluids. They are made in a wide variety of body and trim materials, in ½ to 12 in. sizes.

Ask your local Crane Representative about them, or write to address below for literature.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

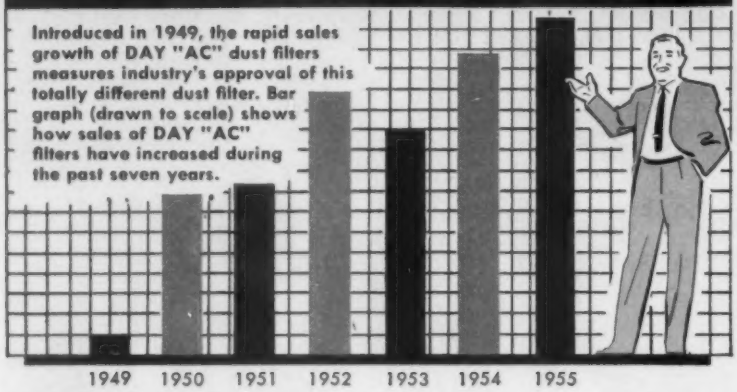
Since 1855—Crane Co., General Offices: Chicago 5—Local Service Everywhere Through Branches & Wholesalers

For more facts circle 588 on Reply Card

DAY REVERSE JET DUST FILTERS

HAVE EARNED INDUSTRY'S ACCEPTANCE

Introduced in 1949, the rapid sales growth of DAY "AC" dust filters measures industry's approval of this totally different dust filter. Bar graph (drawn to scale) shows how sales of DAY "AC" filters have increased during the past seven years.



HERE'S WHY

DAY Reverse Jet Dust Filters HAVE EARNED ACCEPTANCE!

Utilizing the Hersey principle of reverse air cleaning, DAY "AC" dust filters brought industry a needed, long overdue, improved dust filter. This filter has many benefits never before found in any dust filter equipment.

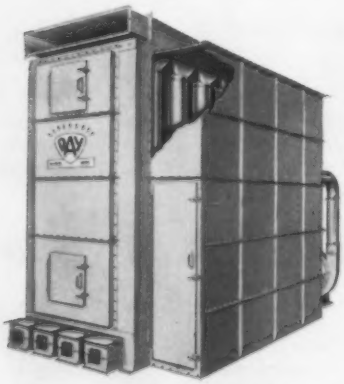
● NEW HIGH EFFICIENCY PERFORMANCE—This filter provides efficiencies measured as high as 99.99+%. This assures cleaner air and higher product recovery.

● NEW FILTER MEDIA—DAY *felted* filter media traps more dust than woven fabric. Felt gives higher efficiency, longer life and has same pressure drop as woven fabric.

● NEW DESIGN FEATURES—The Hersey principle of reverse jet cleaning, DAY self-adjusting blow rings, sanitary square-to-round air inlets, automatic-continuous operation, superior filter media, are just a few of the features introduced by DAY.

● NEW FILTER TUBE CLEANING—Patented self-adjusting blow rings clean the entire filter tube automatically and continuously, to give DAY filters an air handling capacity 5 times higher than ordinary filters.

● NEW LOW INSTALLATION COSTS—Unit sub-assembly saves time and money—up to 75% on filter erection costs.



Licensed by H. J. Hersey, Jr.

The DAY "AC" Reverse Jet Dust Filter is the largest selling filter of its type in the world!

Place the successful operation of your dust control system in our hands. Experienced DAY Application Engineers will survey your plant and supply you with engineered recommendations. With DAY there is no divided responsibility. Our guarantee of satisfaction is backed by 75 years of experience.

Bulletin 559 gives important facts and complete description of the DAY "AC" dust filter. Write toDAY for your copy of this informative 24-page bulletin.

75 YEARS DAY SERVING INDUSTRY SINCE 1881

The **DAY** *Company*

807 Third Avenue N. E., Minneapolis 13, Minnesota
IN CANADA: P. O. Box 700, Fort William, Ontario
Branch Plants: Buffalo, Fort Worth and Toronto, Ontario
Representatives in Principal Cities

For more facts circle 589 on Reply Card

NEW PRODUCTS

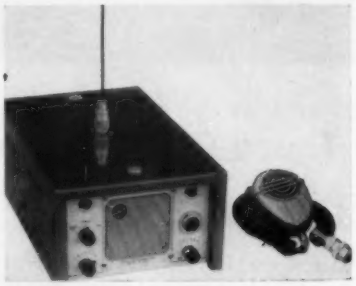
(Begins on page 158)

ing the control dial on this power unit varies the speed of every motor in the system equally and simultaneously. Varidyne motors are of the a-c squirrel-cage induction type, connected to the power unit by standard three-phase circuitry.

According to manufacturer, this system is easy to install and affords a practically unlimited selection of motor types. Enclosures available include drip-proof, totally-enclosed and exposion-proof designs. Speeds of from 1 to 10,000 rpm are available in ratios of up to 5:1; higher speed ratios can be supplied. Motors can be furnished from ⅓ to 25 hp at maximum rpm, and power units are available to carry from 1 to 50 hp connected load. A characteristic attributed to the Varidyne system is that when the motors are operating in tandem, they will equally share the load, eliminating damage from overloads at any one point. The system can be put to unlimited use where groups of variable speed motors must operate synchronously. U.S. Electrical Motors Inc.

7—RADIOTELEPHONE boosts vehicle efficiency

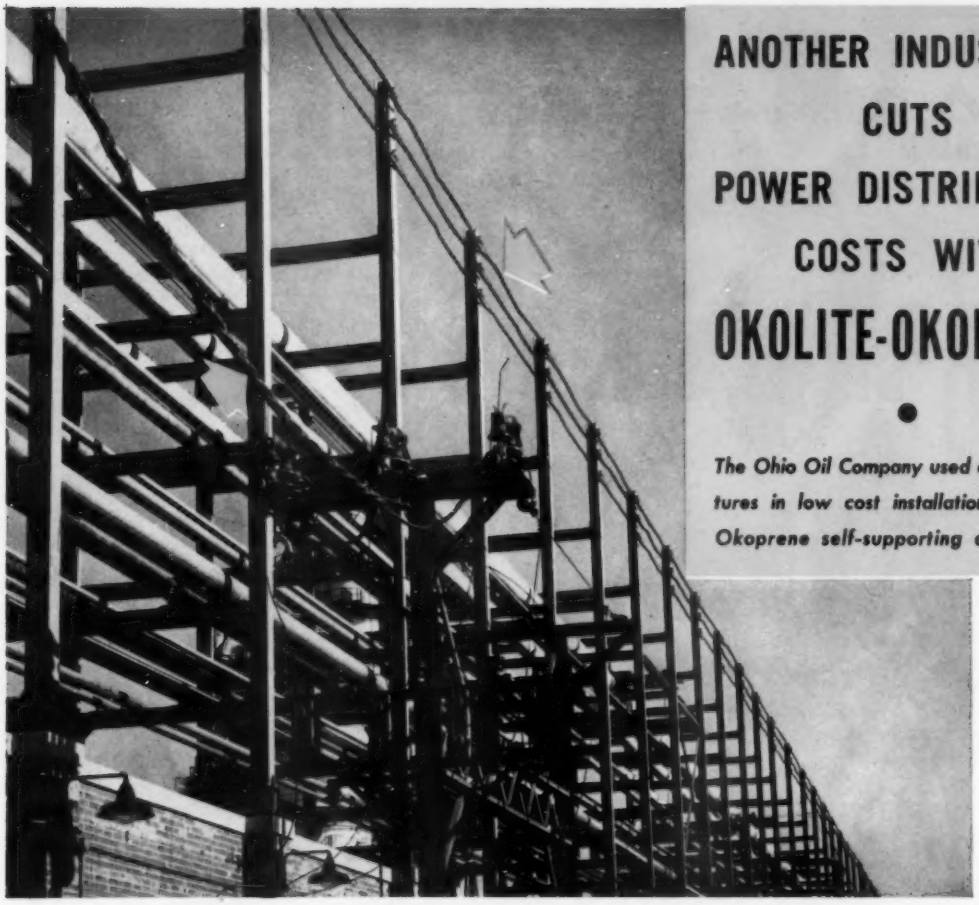
The IMP (industrial mobile phone) is a small, low power radiotelephone for installation on materials handling trucks, messenger vehicles and transportation



units. It is claimed capable of performing the triple duties of base station, mobile unit and mobile public address system. The IMP has a range of 1 to 5 miles and, without modification, operates on 6 v, d-c, 12 v d-c, or 117 v a-c. It is approximately 12-by-8-by-5 in. in size, and weighs 21 lb. Ruggedness is a feature of the IMP, says manufacturer; it is shock mounted and has recessed controls. Low maintenance cost is another advantage announced. It costs around $330. Kaar Engineering Corp.

8—FENCE COATER made with an extra-long nap

Designed expressly for fence maintenance, this lamb's-wool roller features a 1½-in. nap, claimed to reach right around the fence wires and coat about 70 per cent of the opposite side of the wire in one stroke. The 1½-in. length was determined as that giving the greatest



ANOTHER INDUSTRIAL CUTS POWER DISTRIBUTION COSTS WITH OKOLITE-OKOPRENE

The Ohio Oil Company used existing structures in low cost installation of Okolite-Okoprene self-supporting aerial cables

THESE Okolite-Okoprene self-supporting aerial cables illustrate one of the most important economy features of this type of cable. At its refinery in Robinson, Illinois, The Ohio Oil Company made use of an existing pipe and conduit structure to support the Okolite-Okoprene aerial cables.

Okolite-Okoprene was widely used on this refinery installation; primary distribution from the power house to the water distribution unit substation and to the crude unit substation—in all cases the most economical use was made of existing structures.

In addition to economy in installation, Okolite-Okoprene self-supporting aerial cable provides these further advantages:

- **a higher factor of safety**
- **improved voltage regulation**
- **less space requirements**
- **high resistance to weather extremes**
- **high resistance to chemicals and acids common to industrial areas**

Okolite-Okoprene self-supporting cables have proved advantageous in virtually every industry in America. Write for Bulletin PE 1074, Okonite's complete data book on self-supporting cables. The Okonite Company, Passaic, New Jersey.

DESIGN, ENGINEERING, CONSTRUCTION AND PROCESSING SERVICE
J. F. Pritchard & Co., 210 West 10th Street, Kansas City, Mo.

Available with either copper or aluminum conductors

OKONITE SINCE 1878 *insulated cables*

1858

For more facts circle 590 on Reply Card

DYNAPRENE®

Portable Cord

gives LONGER LIFE BETTER SERVICE

BECAUSE

DYNAPRENE is made by experienced wire makers from the finest quality raw materials, checked against Whitney Blake's exceptionally high standards.

BECAUSE

DYNAPRENE is designed and manufactured to provide long flex life and high impact resistance.

BECAUSE

The special neoprene jacket compound created for DYNAPRENE is particularly resistant to abrasion as well as sunshine, ozone, humidity, acid fumes and aging.

BECAUSE

DYNAPRENE is a premium flexible cord sold through electrical suppliers at a reasonable price.

WELL BUILT WIRES SINCE 1899

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WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

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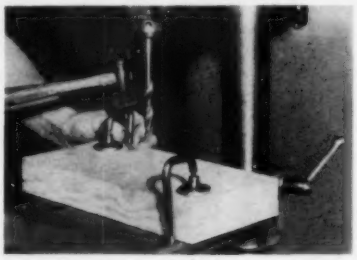
NEW PRODUCTS

(Begins on page 158)

wrap-around action without matting down on adjacent fence wires. Oversize sleeve diameter gives the roller greater carrying capacity and minimizes waste and splatter, says manufacturer, and as a result, practically all of the material goes on the wire itself. It is pointed out that a man with a "dry" roller can pick up the remaining 30 per cent of the area on the other side of the fence, using only surplus material trapped in the wire. Rust-Oleum Corp.

9—SELF-LOCKING CLAMP for use with drill press

J-Lock Workholding Clamps are self-locking and designed primarily for use with a drill press. Priced to retail around $3.00 per pair, the clamp is described as a simple, speedy, hold-down



device featuring ease of use. A tap of the hammer installs these clamps—another tap loosens and removes them. Designed to hold material up to 2½ in. thick, the clamps are said to be particularly useful for holding in place long workpieces laid diagonally across the work table. The clamps are inserted in holes drilled at both ends of the table, the long leg of the inverted "J" entering the hole at an angle, the short leg pinning the work to the table. When the bottom of the "J" is tapped with a hammer, spring action of the leg in the hole holds clamp in position. Delta Power Tool Div., Rockwell Mfg. Co.

10—CONVERSION UNITS with higher voltage ratings

An extended line of selenium a-c to d-c conversion units with single-unit ratings to 125 kw are announced. Up to this time, the company has offered single-unit ratings from 0.75 kw to 25 kw. Company engineers say the advantages of larger blocks of power in single units include cost savings of at least 10 per cent and up to a 100 per cent saving in floor space. A single 125-kw unit, for example, requires only 12.5 sq ft of floor space, compared with 26.8 sq ft for five 25-kw units providing the same amount of power. Large single units also require less maintenance and are easier to install it is pointed out. New unit ratings are 50, 75, 100 and 125 kw. Each rating is offered in either 125 or 250-v-d-c; other voltage ratings may be

No more drudgery for me in cleaning grease-caked floors

A flip of the switch re-sharpens brushes automatically!

His boss is happy too . . .

and should be. Now an Industrial Dry-Scrubber, Finnell's 84XR at left, does the job in about one-tenth the man-hour time required to hand-scrape the floors! And of course the machine is far more thorough, and spares maintenance men the back-breaking effort of manual methods. Equipped with two powerful scarifying brushes, the *84XR* digs through and quickly loosens even the most stubborn coatings of dirt, oil, grease, and shavings. Universal couplings enable the brushes to clean recessed areas that rigid coupling brushes would pass over and miss.

Reversible motor keeps wires sharp. *A flip of the switch* reverses the rotation of the brushes and re-sharpens them automatically . . . *while working!* Eliminates the need for frequent changing of brushes by hand in order to maintain a sharp cutting edge. Reversal of brush rotation also helps keep the brushes functioning efficiently by ejecting sticky substances that would otherwise clog and slow up the cleaning process. Total brush spread of the *84XR* is 22 inches. Low, compact design permits cleaning right up to and beneath machinery — areas where deposits are heaviest. Interchangeable rings and brushes adapt the machine to wet-scrubbing, polishing, and steel-wooling.

Clean floors allow industrial trucks to move swiftly, surely and, according to actual tests, with *half the pull* it takes to move loads over dirty floors. In addition, clean floors aid safety underfoot and contribute to worker productivity. So it pays to keep floors clean — especially with a labor-saving *84XR!* (The Vacuum Cleaner at extreme left, *Finnell's 10B* for wet and dry pick-up, features a By-Pass Motor.)

For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5306 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

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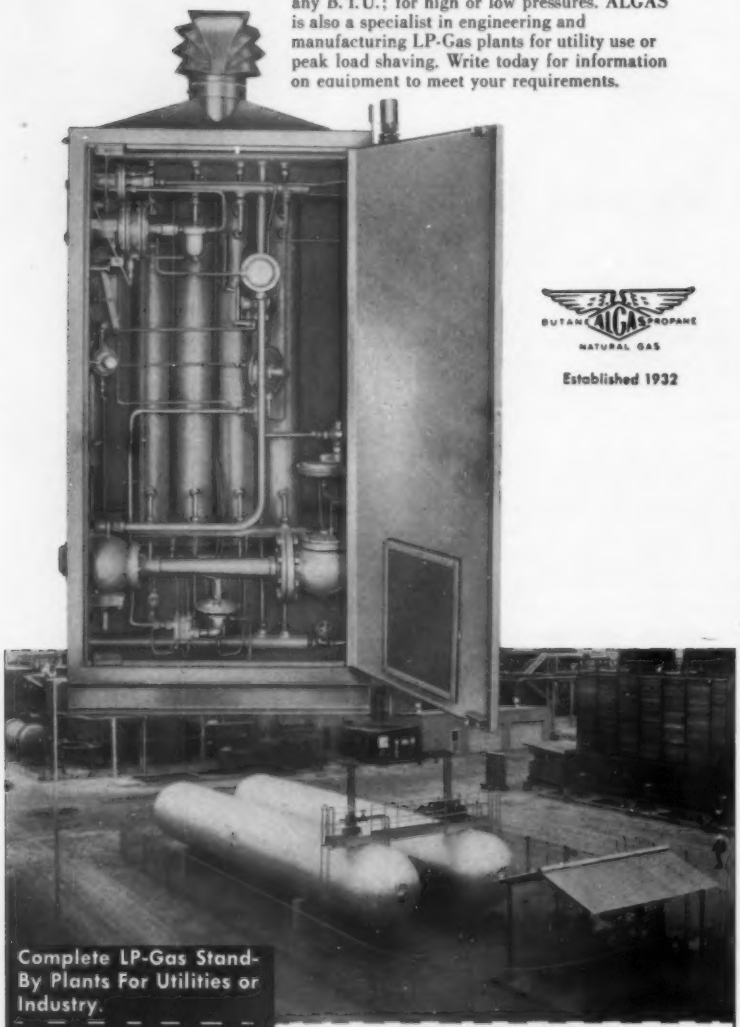
The new line of **ALGAS**

LP-Gas Vaporizers, Vaporizer-Mixers and Mixers Only...For Use by UTILITIES and INDUSTRIES

To meet an increasing demand for an automatic self-contained LP-Gas plant, ALGAS has developed this new line of vaporizers, mixers and vaporizer mixers. This equipment is engineered and manufactured for outdoor, year 'round service; for any B.T.U.; for high or low pressures. ALGAS is also a specialist in engineering and manufacturing LP-Gas plants for utility use or peak load shaving. Write today for information on equipment to meet your requirements.



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NEW PRODUCTS

(Begins on page 158)

ordered. Applications include d-c power for cranes, hoists, shop machine tools in industry, for printing press drives, for elevators and other equipment. Units can also be used for synchronous motor excitation. General Electric Co.

11—SURFACER for new or worn concrete floors

Developed to resist the attack of acids, alkalis, water, oil and grease, Rockflux is described as a practical finish for application over new, wet concrete or for patching or resurfacing old floors at ½ in. or more. This material is claimed to have three times the compressive strength and four times the serviceability of concrete. Manufacturer says it wears like iron. Rockflux comes ready mixed in balanced proportions — you just add water. Setting time is given as 24 hr. The product is shipped in 100-lb bags. Flexrock Co.

12—DRAWING BOARD folds away in the desk

The Arnot Foldaway Drawing Board tucks away in a center drawer beneath a desk or table and slides out quickly. It is offered for plant engineers and others whose jobs call for a little drawing or drafting in addition to regular desk duties. The unit consists of the

complete drawer, drawing board and parallel rule. Although primarily designed to go with company's own line of office furniture components, this unit can be bolted or screwed to other desk or table tops. When folded away the drawing board is out of sight and the unit appears as a conventional center drawer. Two sizes may be had—the smaller unit has a 24-by-24 in. drawer with a 20-by-15 in. board and costs less than $26.00; the larger, a 30-by-30 in. drawer and 26-by-21 in. board, and costs around $32.00. Green, gray or tan colors are available. Arnot-Jamestown Div., Aetna Steel Products Corp.

13—MUFFLERS reduce pumping noise in refrigeration

These mufflers are designed for use in reducing pumping noise in refrigeration or air conditioning systems. Easily in-

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the *first* truly

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GALVANOMETRIC RECORDER

CONSERVE VALUABLE SCIENTIFIC AND ENGINEERING TIME with the most convenient and modern recorder available today . . . featuring the error-free trigonometric linkage that gives you straight line writing motion — the exclusive

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Make direct readings with a simple ruler . . . perform all routine operations from the front of the instrument. . . get ± 1% accuracy over full 4½-inch scale; sensitivity of 0.45 of an inch per 100 microamperes; pen speed at a quarter-second over full 4½-inch deflection. . . use ac drive, 6, 12, or 28-volt dc drive; spring-drive; or external drive. . . make standard or "gear shift" chart speed changes.

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Here's Lift Power that Lowers Costs!

SIMPLEX JACKS

Engineered to deliver maximum power at minimum weight, Simplex Hydraulic Jacks meet every jacking need with ease, safety and dependability. Eight models, in capacities from 3 to 100 tons, Sold *only* through Industrial Distributors.

Get your free guide to jack selection. Ask for Bulletin HYD. 53.

A Jack for Every Purpose

The Simplex line of jacks is complete. It includes rachet lowering, track, screw and hydraulic jacks; self-contained and remote-controlled center-hole pullers; trench and timber braces. Buyers have known Simplex means quality in jacks for more than 50 years.

WORLD'S LARGEST MFGRS. OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS

SIMPLEX JACKS

99-MO-TROL JENNY UTIL-A-TOOL ROL-TOS

TEMPLETON, KENLY & COMPANY

2561 Gardner Road Broadview, Illinois

For more facts circle 595 on Reply Card

NEW PRODUCTS

(Begins on page 158)

stalled on discharge line of any refrigeration compressor, muffler serves to eliminate pulsations and vibrations. Described as low in cost, simple in design and construction, mufflers are designed for smoothness of system operation, reducing maintenance cost and prolonging equipment life. They are built to ASME specifications and feature seamless pipe and rugged, all welded steel construction. Expansion chambers and baffles are arranged for maximum efficiency and minimum pressure drop. No maintenance is required, says manufacturer. Heat-X, Inc.

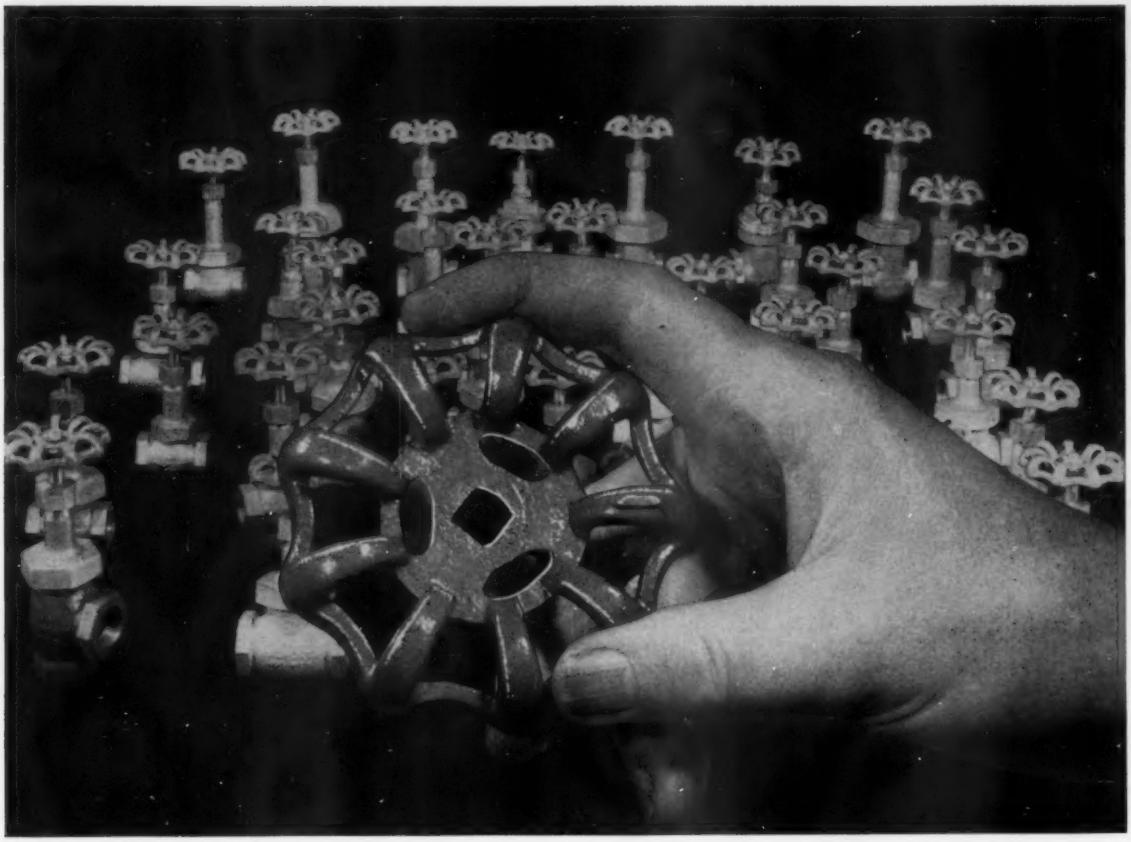
Use the Reader Service Cards provided on pages 227-228 to ask for more information on these products. Circle item numbers of products in which you are interested.

14—PLASTIC PANEL features greater weather resistance

Made from special resin, Structoglas A Panels have superior service life, it is said, color stability, strength and infrared filtration, as well as an all-new color line. According to company these Fiberglas-reinforced panels feature 2.23 times greater weather resistance, have more than twice the inherent color stability and will support up to 100 per cent more weight per square foot than many other types of plastic panels. To assure cooler as well as bright glare-free light, material also utilizes a new additive that filters up to 50 per cent more infra-red rays than similar types of compounds—of special importance when panels are used for window, skylight or roofing applications. A new line of harmonizing colors is another feature of the panels. Structoglas A is suggested for both exterior and interior uses. Structoglas Div., International Molded Plastics, Inc.

15—FLOOR CRANE has telescopic outrigger

This quarter-ton capacity portable hand-operated hydraulic floor crane features a telescopic outrigger which can be extended to either side of the unit to offer stability. Crane's boom can be unlocked from its usual position of alignment between the crane's legs and swung to the side a full 90 deg. This allows crane to reach loads previously inaccessible on account of having legs obstructed by base of machine. Also this feature lets crane work in narrow aisles where it is impossible to turn to reach the load. It has a rated capacity of 500 lb and is equipped with a self-contained hydraulic system incorporating an overload relief set at 700 lb. The unit is portable and turns in own length. It is 65 in. long,



One handwheel fits 40* different valves

*Walworth Handwheel No. 16 fits these Walworth Bronze Valves:	
¾"	No. 32, 40, 47, 48, 205, 206, 225P, 227P, 260, 261, 260P, 261P
1"	No. 29, 30, 36, 37, 91, OX91, 92, 95, 96, 160, 161, 235, 236, 245, 246, 245P, 246P, 237P, 238P
1¼"	No. 58, 59
1½"	No. 2, 3, 4, 11, 12, 14, 24

Only Walworth Bronze Valves give you this degree of interchangeability

With standardized Walworth Bronze Valve parts you maintain the greatest number of valves with the smallest inventory of basic parts. Handwheels are just one example. Fourteen different sizes of handwheels are all you need for fifty lines of gate, globe, and angle valves, involving 420 individual valves.

The Walworth system of interchangeability of parts for Bronze Valves is unsurpassed by any manufacturer in the field. In addition to Bronze Valves, Walworth produces valves and pipe fittings of iron, steel, special alloys, and rigid polyvinyl chloride (PVC).

Learn more about Walworth interchangeability. Contact your local Walworth Distributor or nearby Walworth Sales Office. Ask for literature.

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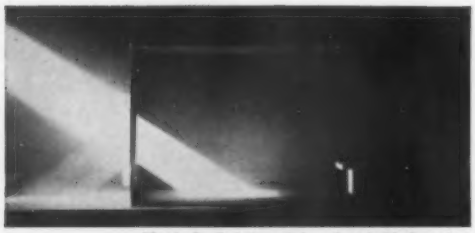
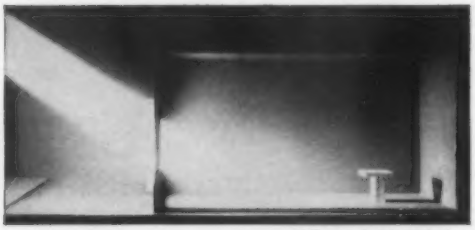
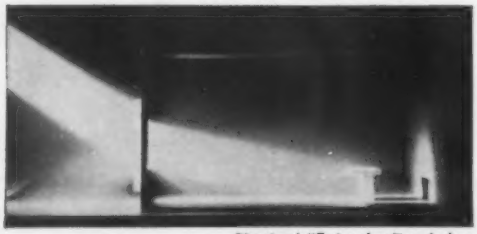
THERE'S MORE TO *daylight* THAN MEETS THE EYE



"Smoke Box" photo—window glazed with clear glass.



Diffusing glass in smoke box.



Directional diffusing glass in smoke box.

Stop Glare and Heat with Light Diffusing Glass

Like other natural resources daylight needs to be controlled to be of greatest benefit. "Raw" daylight seldom meets specific lighting needs, since it contains a host of unwanted factors that cause discomfort and inefficiency. Obtain the results you want by specifying a glass "visioneered" to meet your requirements.

Good daylighting can be achieved with a handsome, modern, diffusing pattern which disperses softened light deep into interiors, provides comfortable, even illumination without harsh glare and sharp contrasts that cause costly eye fatigue. And if excess heat is a problem, keep interiors more comfortable with Mississippi Coolite, heat absorbing, glare reducing glass, which absorbs up to 50% of solar heat rays.

In your new building or remodeling projects gain all the benefits of natural light without the drawbacks. Control "raw" daylight by specifying Mississippi Glass. Available everywhere in a wide variety of patterns and surface finishes, wired and unwired, all "visioneered" to solve your daylighting problems.

Write today for free catalog No. 56G • Address Department 13.

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WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

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NEW PRODUCTS

(Begins on page 158)

33 in. wide, with outrigger closed. With outrigger extended, the width becomes 83 in. The boom has a vertical travel of 68 in. Ruger Equipment, Inc.

16—SWITCHING MODULES are rugged, simple units

Building blocks of electrical control, Mark II Cypak Components are similar in basic circuitry and logic to company's previously introduced static switching systems. According to manufacturer, these new units offer such advantages as simplicity, lower system cost, greater efficiency in space use, and ruggedness against mechanical and environmental

hazards. The new components are modular plug-in cartridges about 3-in. high, 2 in. wide and 2 in. deep. Encapsulated in a tough polyester resin and fitted with terminals on the upper and lower faces, the modules plug into a specially designed power channel. Studs lock the modules in a compact, nearly solid assembly. When more than 15 modules are required for a system, additional channels can be mounted side-by-side or end-to-end.

It is considered likely that systems built with the Mark II units will be more economical than those built with the earlier components principally because the new ones permit substantial reductions in time required for system design, assembly and wiring. System costs will also be decreased due to the diminished space requirements. Westinghouse Electric Corp.

17—CONVEYOR BELT hauls those hot materials

Scorching chunks of hot metal, heated to temperatures as high as 1400 F, are reported not to burn holes through the Fire Curtain, a rubber conveyor belt designed for handling hot materials. Made with glass fabric insulation, Fire Curtain Belts have two plies of glass fabric that float in top rubber cover. Glass fabric retains its strength despite intense heat, it is noted, thus barring progress of fiery metal objects through belt. When a hot piece of metal drops on it, belt's rubber cover chars at that spot, but only as far down as the glass fabric heat barrier. Fire Curtain was developed for use in foundries where burnt holes are a major

How to Cut Compressed Air Costs On Air Operated Equipment

. . . Substantial savings result through proper regulation of compressed air.

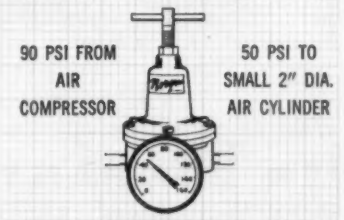
For any kind of air-operated equipment, there is one pressure at which it is designed to operate most efficiently. At a higher pressure, the equipment will wear excessively—with no significant increase in output—and compressed air will be wasted.

Compressed air efficiently used is a relatively inexpensive power medium. However, considering the investment in compressing equipment, operating expenses and the cost of power, the waste of compressed air is costly to any plant.

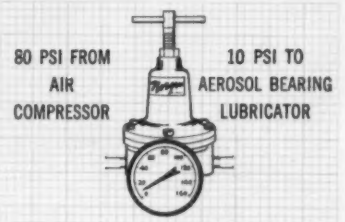
The total cost of compressed air can be cut by regulating the line pressure to the working pressure recommended for the air-powered equipment. Therefore, use of a reliable air pressure regulator is of importance to efficient plant operation and maintenance.

Here is how savings in compressed air can add up to a substantial amount of money in only a year's time—

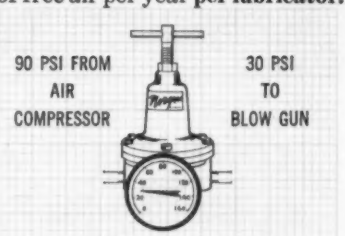
For air-tool service, reduction of a 110 psi line pressure to the recommended working pressure of 90 psi by a Norgren Pressure Regulator would save around 180,000 cubic feet of free air per year on **only one air tool used only 50% of the time.**



Normal use of a 2" diameter cylinder with a 2" stroke at a pressure reduced by a Norgren Regulator from a 90 psi line pressure to 50 psi, would save 2,000 cubic feet of free air **per cylinder** per year.



For an aerosol bearing lubricator, use of a Norgren Regulator to reduce a line pressure of 80 psi to the recommended working pressure and flow of 10 psi and 1 cfm, could save approximately 125,000 cubic feet of free air per year **per lubricator.**



A blow gun operated at a working pressure of 30 psi will be just as effective and much safer to use than at a line pressure of 90 psi—and about 90,000 cubic feet of free air could be saved a year on **one gun used only an hour a day.**

Multiply each of these savings in compressed air by the many units of air-equipment in any one plant and the total savings effected by use of pressure regulators becomes worth-while.

For complete information about Norgren Pressure Regulators, and how they can cut costs in your plant, call your nearby Norgren Representative listed in your telephone directory —or WRITE THE FACTORY FOR NEW No. 700 CATALOG.

C. A. Norgren Co.

3443 SO. ELATI ST.
ENGLEWOOD, COLORADO

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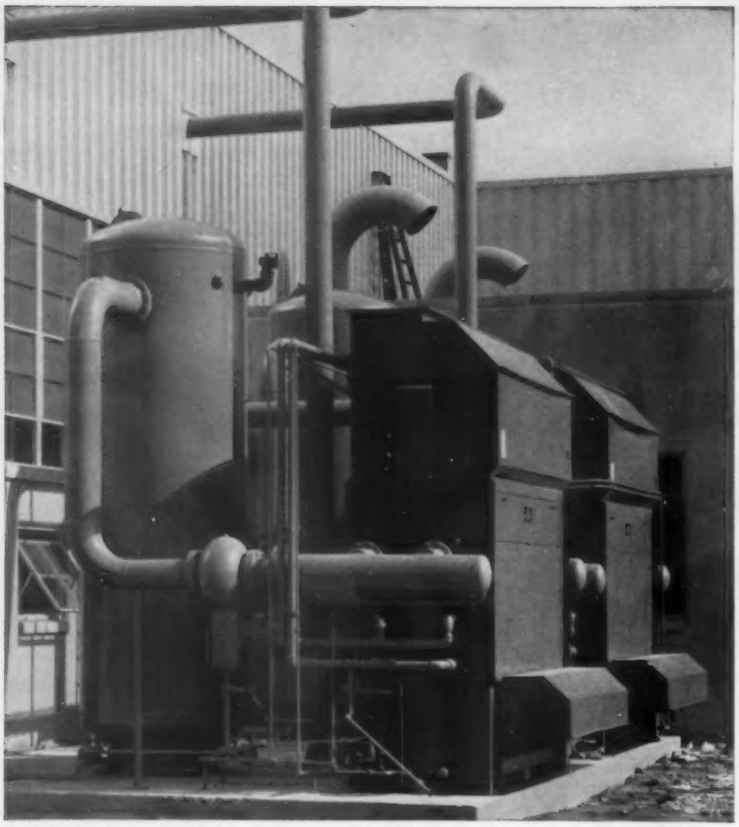


This Niagara Aero After Cooler also cools compressor jacket and intercooler water.

COMPRESSED AIR... Lower in Cost Dependably Drier and Cooler Trustworthy for Instrument Use

THE NIAGARA *AERO* AFTER COOLER offers a completely self-contained method replacing both shell-and-tube cooler and cooling tower. It is independent of a large supply of cooling water and consistently reduces compressed air temperatures to below ambient. Its drier air gives you a better operation and lower costs in the use of all air-operated automatic instruments, tools and machines, paint spraying, sand blasting and moisture-free air cleaning.

Direct saving in the cost of cooling water saves the price of the Niagara *Aero* After Cooler in less than two years. Water saving also means less expense for piping, pumping, water treatment and water disposal, or you get the use of water elsewhere in your plant where it may be badly needed.

Niagara *Aero* After Cooler assures all these benefits because it cools compressed air or gas below the temperature of the surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air thru a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter, proven in service on the largest plant utility air systems.

Write for complete information; ask for Bulletin No. 130

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. PE, 405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities

For more facts circle 599 on Reply Card

NEW PRODUCTS

(Begins on page 158)

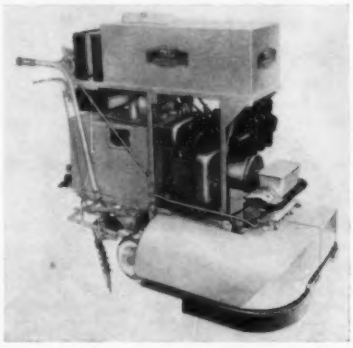
cause of belt failure. The construction is available also for hot material conveyor belt applications in other industries. B. F. Goodrich Industrial Products Co.

18—BATTERIES with higher instantaneous discharge

These new Exide-Manchex Batteries, in heat-resistant polystyrene jars, are designed for stationary power applications in utility, telephone, railway and industrial plant operations. They retain the basic Planté positive plate, a feature of all Exide-Manchex Batteries. Major improvements are announced as providing for increased battery life; higher instantaneous discharge rates; reduced maintenance because of less frequent additions of water, more effective sealing and easier cleaning; and ready adaptability to cycle service as well as float service. Covers are sealed to jar and terminal posts. Exide Industrial Div., The Electric Storage Battery Co.

19—SCRUBBER-VACUUM, gas powered, in smaller size

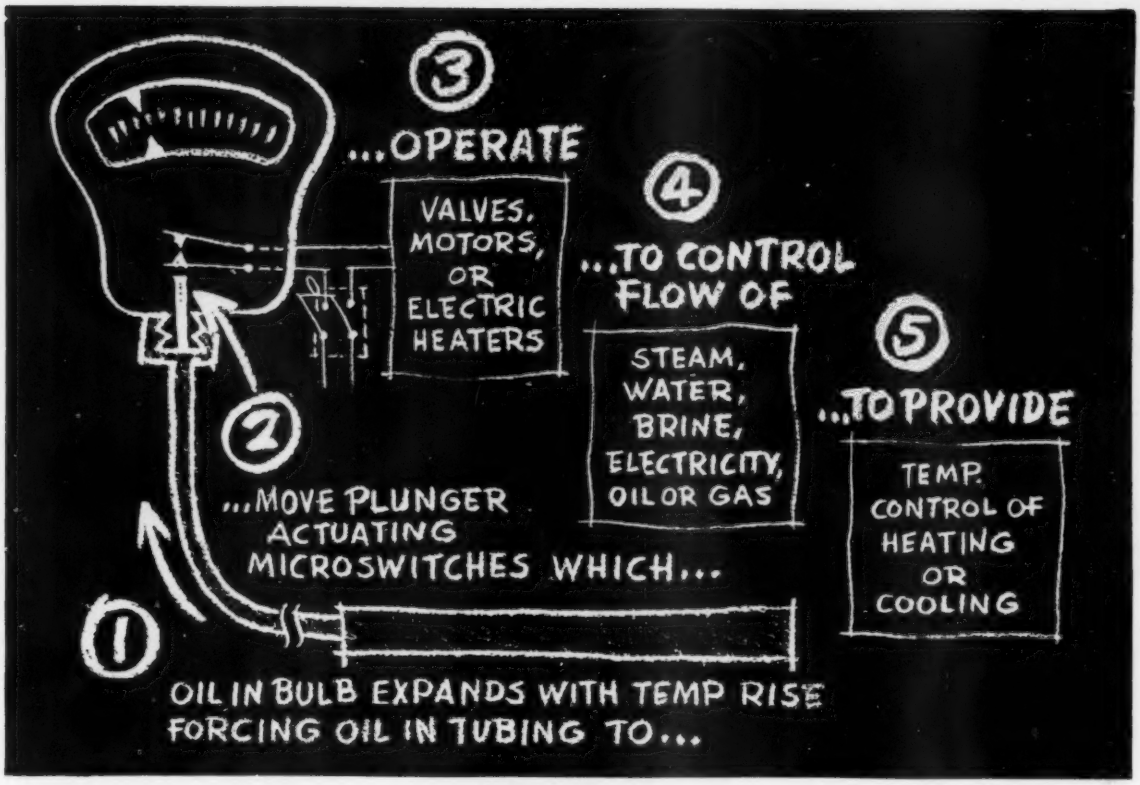
Specifications for this new smaller-sized gasoline-powered Scrubber-Vac are the same as for the larger Model 218G now in use except for the brush spread. The



new Model 215-G2 has two 15-in. brushes and gives a 30-in. scrubbing surface. The Model 218G has two 18-in. brushes and gives a 36-in. scrubbing surface. Like the larger model, this new unit applies the cleanser, scrubs, picks up (dampdries the floor)—all in one operation. It has a self-starting gasoline engine (two cycle, four cycle, 9.4 air cooled) which operates all working parts. Gasoline is the only fuel required. Slight pressure of the hand on the clutch lever adjusts speed to desired rate, up to 136 fpm. Finnell System, Inc.

20—CROSS BRIDGING makes neat, strong floor joists

Stur-D Ribbed Steel Cross Bridging for floor joists has a number of advantages, it is announced, among which are strength, neat appearance, economy in



INDICATING

Automatic Temperature Control

It's simple...dependable!

That rough sketch above tells the story. It shows Sarco's simple electric indicating temperature control . . . and what it can do for you.

Really mighty simple, isn't it? Yet, it's adjustable, indicating and provides dependable accuracy to ± ½°F. No gadgets that call for a technician to read and repair! So simple, so trouble-free . . . maintenance is seldom, if ever, needed.

Turn one knob to change the temperature control setting. Large, easy-to-read scale shows you both the actual and the set temperature.

SEQUENCE CONTROL

And this Sarco electric temperature control is versatile . . . it offers you many sequence combinations such as:

- **Step-heating**
- **Heating and cooling**
- **Wide limit control**
- **Temperature control plus operation of signal devices**

Cost . . . only about $100! It's good economy to specify AUTOMATIC temperature control for ALL control jobs, not just the big ones. So mail the coupon now for complete information.

SARCO

Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.

Please send information on your simple, inexpensive temperature controllers:

☐ Self-powered type for use on_____

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Very Few CONVEYING PROBLEMS are New to Us...

A system of spring-mounted roller conveyers, with transfer car, handling heavy pots in which pins and bushings are carborized.

Every day some manufacturer runs head-on into a conveying problem that's new to him . . . a handling job that he hasn't had to do before. It may be a package of unusual size or shape, or there may be unusual characteristics regarding space, temperature or weight.

Whatever the problem might be, chances are, we've done something like it, somewhere, sometime before.

That's where experience pays off, and you get the benefit of fifty years of it when you buy Mathews Conveyers.

50 YEARS OF MC MECHANIZED HANDLING

MATHEWS CONVEYER COMPANY

GENERAL OFFICES . . . ELLWOOD CITY, PENNSYLVANIA

PACIFIC COAST DIV., MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA

CANADIAN DIVISION . . . MATHEWS CONVEYER COMPANY, LTD. PORT HOPE, ONTARIO

Engineering Offices or Sales Agencies in Principal American and Canadian Cities.
Export Representative—Foreign Trade Division of New York Hanseatic Corp.

MATHEWS

For more facts circle 601 on Reply Card

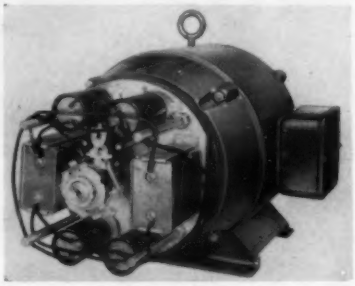
NEW PRODUCTS

(Begins on page 158)

labor, and more room between joists for piping and wiring. Bridging may be used in new installation, or for strengthening floors in existing buildings. It may also be used as a bracing for studding. Cross-bridging, which arrives on the job site ready for use, is made of 16-gage galvanized, rust resistant V-ribbed steel. Ends are flat with five nail holes in each end for variable fit-ups. The 20-in. lengths can be used with 2-by-8, 3-by-8, 2-by-10, 3-by-10, 2-by-6, and 3-by-12 ft joists; the 17-in. lengths can be used with 2-by-8 3-by-8 and 3-by-10 ft joists. The F. D. Kees Mfg. Co.

21—PROTECTED MOTORS in 10- and 15-hp sizes

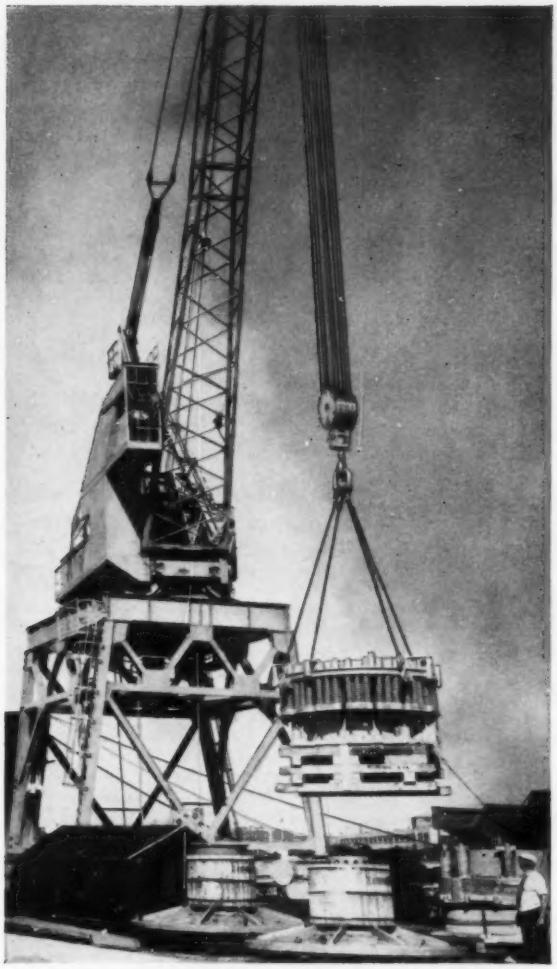
Three new motors — two rated at 10 hp and one at 15 hp—are described as completely protected against the weather, debris and small field animals. The high torque capacitor-start capacitor-run



motors are available in 1725 and 1140 rpm speeds. They are suited for applications requiring more than 7½ hp on single phase operation. The motors have screens in the endhead openings to seal them against entry of large objects. External mounting of condensers and centrifugal switch mechanism in weather-proof covers serves to permit easy inspection even while motor is operating. These motors have a one-piece steel sheet and all steel parts are protected by a moisture-and-rust-resistant undercoating. Robbins & Myers, Inc.

22—FLUORESCENT LAMP gives increased light output

Expected to be available for lighting installations in 1957, Power-Groove Fluorescent Lamp is said to have double the light output of present tubes of equal length. This is attributed to the tube design which features a series of dents or grooves along one side of tube. At the grooves, tube is nearly U-shaped in cross-section. Design permits maximum circumference of tube while constricting its inside area. Greater light output results from an increase in area of lighted tube surface, higher wattage at which tube can be operated, and more effective use of energy within it. Scientific principle involved is to diminish the internal



Whatever your needs, Macwhyte makes the sling, wire rope, or assembly for your equipment. Here, two ATLAS Assembly E-2, Round-Braided Slings handle cargo. These balanced braided slings have an excellent reputation for safe, fast, easy handling.

These wire rope products
SAVE TIME AND MONEY

The ability of wire rope to serve you relies on the quality you buy and the selection of the proper material.

Because Macwhyte Company has a wide selection of quality products, you can be sure the sling, wire rope, or wire rope assembly you buy meets the needs and service conditions of *your* equipment, and is designed to give outstanding service at low operating cost.

Your Macwhyte distributor will give you prices, literature, and catalogs, and can supply you promptly with standard or custom wire rope, cable assemblies, slings, aircraft cable, tie-rods, and swaged fittings.

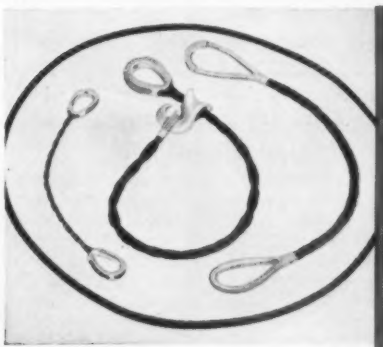
MACWHYTE
WIRE ROPE · SLINGS · WIRE ROPE ASSEMBLIES

Macwhyte Company, 2991 Fourteenth Avenue, Kenosha, Wis.

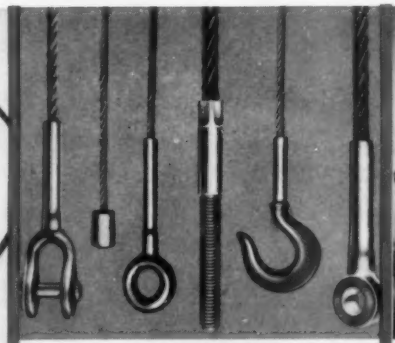
Manufacturers of: Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope, and Wire Rope Assemblies. Special catalogs available.

New York 4, 35 Water St.
Pittsburgh 19, 704 Second Ave.
Chicago 6, 228 So. DesPlaines St.
Detroit 3, 75 Oakman Boulevard
St. Paul 14, 2356 Hampden Ave.
Ft. Worth 1, P.O. Box 605
Portland 9, 1603 N. W. 14th Ave.
Seattle 4, 87 Holgate St.
San Francisco 7, 188 King St.
Los Angeles 21, 2035 Sacramento

Distributors conveniently located throughout the United States.



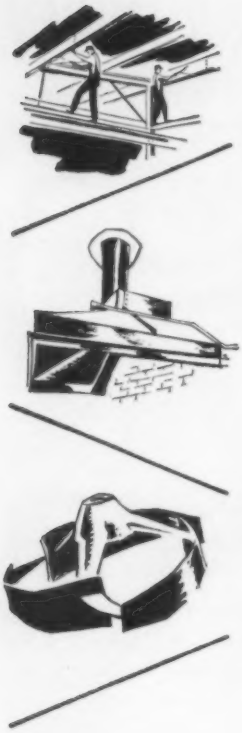
BRAIDED SLINGS. Hundreds of custom and standard designs in Round-Braided, Flat-Braided, Single-Part and Grommet slings are supplied for almost any material handling need. *Catalog S-8 gives complete information.*



WIRE ROPE ASSEMBLIES. Macwhyte Safe-Lock Wire Rope Assemblies are made to order in length, strength, and flexibility desired. Terminals are permanently attached to one or both ends. A wide selection of fittings are made in strengths from 500 to 85,000 lbs. and up. *Request Catalog 5601.*

WIRE ROPE. There are *a thousand and one* sizes and types of Internally Lubricated Macwhyte wire rope to give you the *right* rope for any equipment need. *Catalog G-16 lists all wire rope classifications and sizes, as well as general information on use and handling.* 10048W

For more facts circle 602 on Reply Card



complete protection against

CORROSION with ATLAS PROTECTIVE COATINGS

An ATLAS Protective Coating for Every Purpose . . .

No one coating will serve every purpose. Physical and chemical limitations require selection of the coating most effective in protecting equipment from splash and fumes of corrosive agents used in each processing operation. Atlas experience can help you take the guesswork out of coating selection.

Pioneers in corrosion protection, Atlas produces a complete line of neoprene, vinyl, styrene, epoxy, chlorinated rubber and polyester coatings. Atlas engineers will be pleased to recommend, from this line of protective coatings, the most economical and effective coating to combat the specific corrosion problems that exist in your plant.

FOR FURTHER DATA . . . Write for Bulletin 7-2

TECHNICAL REPRESENTATIVES LOCATED THROUGHOUT THE UNITED STATES.

ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

For more facts circle 603 on Reply Card

NEW PRODUCTS

(Begins on page 158)

loss of energy before it can be turned into visible light, company explains. The loss is caused by absorption in the area within the bulb, and since radiation has less distance to travel, more of it survives to activate the phosphor and create light.

Power-Groove will have many commercial and industrial applications, it is pointed out, and is expected to extend the use of fluorescent lighting into areas which have heretofore used other sources. It will be of particular advantage in high-bay lighting and outdoor floodlighting. Basic length will be 8-ft, but 4- and 6-ft lamps will be available. The lamp is 2⅛ in. diam., rated at about 200-w. General Electric Co.

23—DEODORIZER for use with air conditioning systems

Eastonair evaporates when placed in a moving air stream, manufacturer states, and liberates neutralizers to eliminate disagreeable odors often found in air conditioning systems. It is also said to freshen stale air without imparting a new odor to the system. According to manufacturer, this deodorant contains no vegetable dyes, and no chemical agents that deaden the sense of smell; it does contain a synthesized chemical agent that is non-toxic and non-irritating; and it does not require reactivation. Eastonair comes in 1-lb jars, 5- and 10-lb cans. No special apparatus or duct openings are required for installation, it is noted, and there is no danger of spilling or corrosion. Easton R. S. Corp.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 227-228. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

24—BLAST CLEANER is batch-type airless unit

Announced as offering greater cleaning efficiency and reduced costs, the Super Tumblast has an operating load capacity of 28 cu. ft. It is designed for blast cleaning sand, scale, oxides and other contaminants from any work able to withstand a tumbling action, and may be operated automatically or manually. A key to its faster cleaning is the hurling of a large volume of abrasive upon the work, accomplished by a single super-capacity airless blast unit throwing 830 lb of abrasive per minute. This enables the Super Tumblast to employ only one abrasive hurling wheel, instead of two, as used by many machines of this capacity.

A problem in blast cleaning is removing sand and scale from the abrasive—

Wagner **ELECTRIC MOTORS... the choice of leaders in industry**

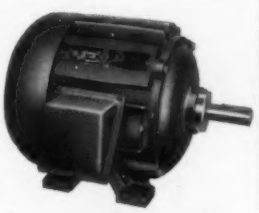
Wagner Protected Type Industrial Motors

lower your maintenance costs—cut down-time

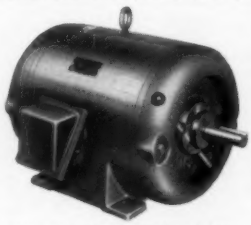
Wagner offers a complete line of protected type motors, specifically designed for use where severe conditions demand EXTRA protection—for bearings or windings... against corrosive vapors or abrasive dirt ...in explosive atmospheres or exposed outdoor locations.

In their specific applications, each of these Wagner Motors assures completely dependable performance—with a minimum of maintenance and a maximum of freedom from costly down-time due to motor failure. Openings are provided for relubrication to greatly prolong bearing life.

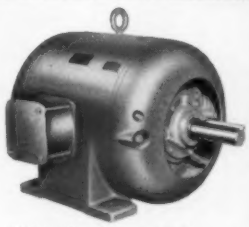
A Wagner engineer, expert on motor applications, will be glad to help you select the *right* motors for your specific needs. Just call the nearest of our 32 branch offices, or write for Wagner Industrial Motor Bulletins.



TYPE EP—Ribbed frame fan-cooled. New NEMA Frames. 1 to 30 hp.



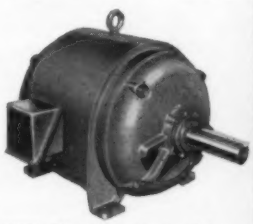
TYPE EP—Totally-enclosed fan-cooled. Corrosion-resistant frames. 40 to 250 hp.



TYPE JP—Fan-cooled ... Explosion-proof. Cast iron frames. 40 to 250 hp.

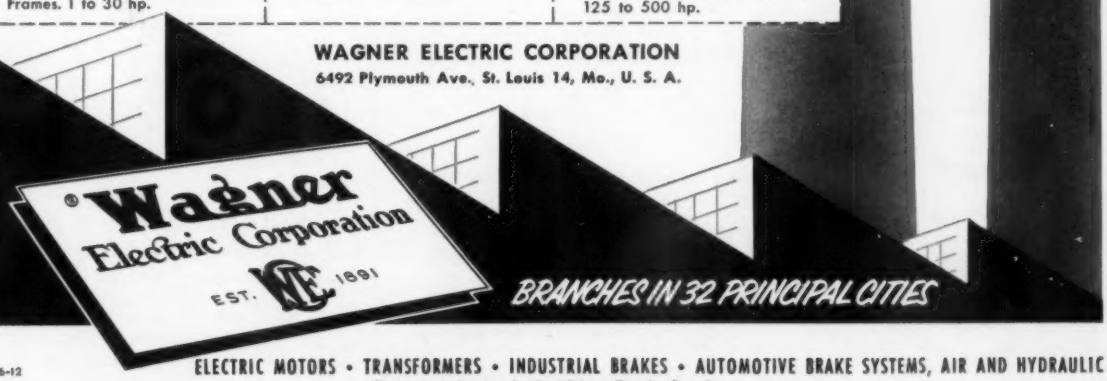
TYPE DP—Drip-proof ... corrosion-resistant. New NEMA Frames. 1 to 30 hp.

TYPE DP—Drip-proof. Cast iron frames. 40 to 125 hp.



TYPE RP—Open-type drip-proof. Welded steel frames. 125 to 500 hp.

WAGNER ELECTRIC CORPORATION
6492 Plymouth Ave., St. Louis 14, Mo., U. S. A.



M56-12

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS, AIR AND HYDRAULIC

For more facts circle 604 on Reply Card

ROTARY OILDRAULIC® ELEVATOR

selected for mammoth lifting job in

New York Coliseum

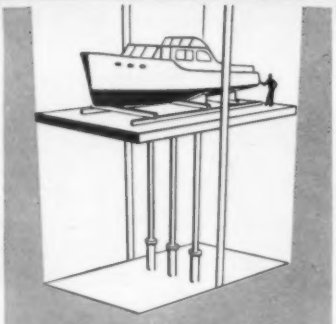
Oil-hydraulic elevator raises 75,000-lb. loads a height of 62 feet

One of the world's largest elevators serves the new $35 million Coliseum in the heart of Manhattan. Built by Rotary Lift Co., it will handle any object that might be displayed in the four-level exhibition hall of this imposing structure.

Hydraulic jacks move and support the 15′ x 50′ elevator car, providing smooth, safe, dependable operation.

Saves construction costs—Because it is pushed up from below, not pulled from above, the Rotary Oildraulic Elevator has many advantages for modern buildings. There is no need for an expensive penthouse, heavy load-bearing sidewalls or special machine room.

Automatic floor leveling, advanced controls, and operation with or without attendant are other important features. Consistently smooth, economical operation has been proved in more than 100,000 hydraulic elevating units built by Rotary Lift Co.



THREE powerful oil-hydraulic jacks provide 75,000 lifting capacity for Rotary Elevator in New York Coliseum.

Nationwide service—Rotary Oildraulic Elevators are sold, installed and serviced by a national distributor organization. Look for "Rotary Oildraulic" under "Elevators" in the yellow pages of your phone book or write for complete information.

MAIL FOR ELEVATOR CATALOGS

Rotary
OILDRAULIC® ELEVATORS
Passenger and Freight

Rotary Lift Co.,
1121 Kentucky, Memphis 2, Tenn.

Please send free catalog on Rotary Oildraulic Elevators for: Passenger Service ☐; Freight Service ☐

Name_____

Address_____

For more facts circle 605 on Reply Card

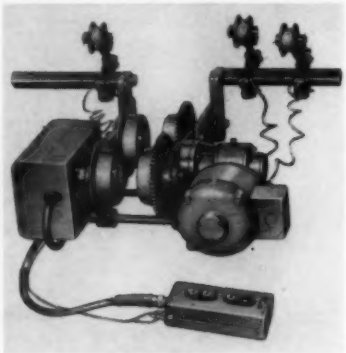
NEW PRODUCTS

(Begins on page 158)

such contaminants decrease cleaning efficiency, increase cleaning time, and wear machine parts. Another problem is that volume of contaminants is heaviest during the beginning of a blast cleaning cycle and lighter at the end. The separator on the Super Tumblast is said to solve these problems—taking out the heavy concentrations of sand and scale at the beginning of a blast cleaning cycle at first, without removing valuable abrasive later. Wheelabrator Corp.

25—MOTOR DRIVEN TROLLEY is push-button controlled

Series 600 is announced as a lightweight single speed push-button controlled motor driven trolley for installation on electrically powered hoists of 1,000- through 2,000-lb capacities. It is available with optional traversing speeds of 65 or 100 fpm. Trolleys incorporate wide-section



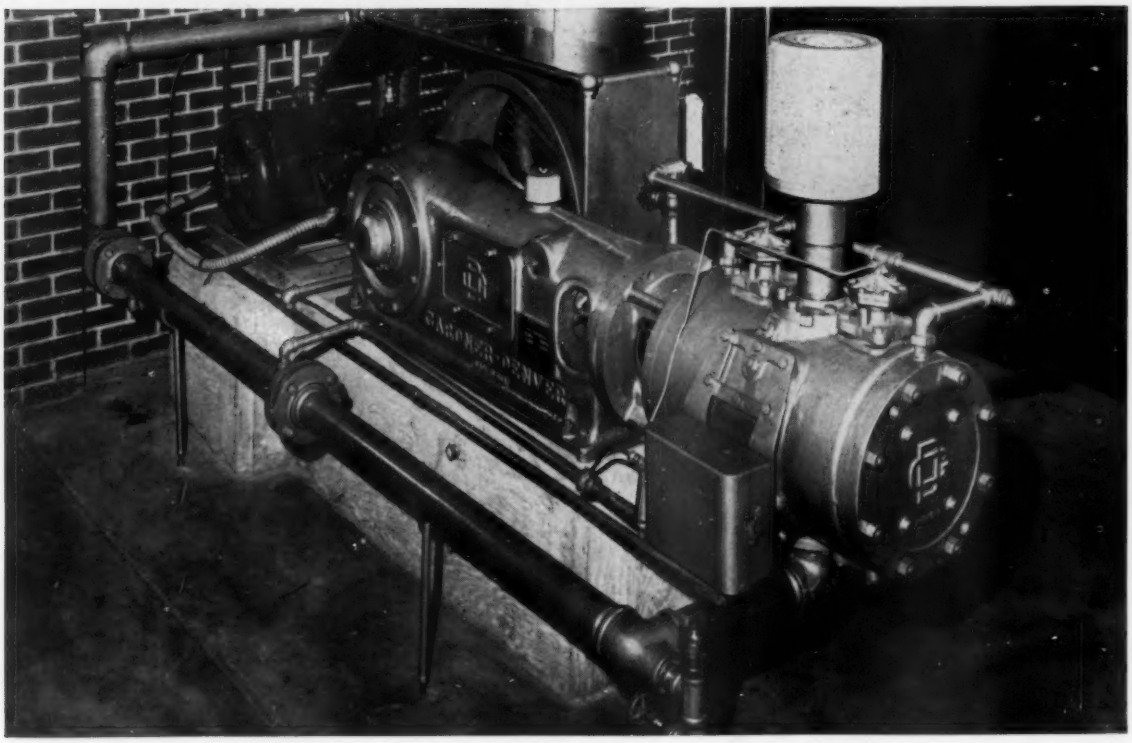
side plates of rolled steel plate and steel traverse wheels with hardened treads for long life. Traverse wheel span is adjustable to fit 5 to 12 in. tapered flange I-beams, permitting relocation of trolley on various size I-beams without reworking trolley.

A mechanically interlocked 24-v, four-button control station is provided to eliminate possibility of electrical damage should both "Up" and "Down" "Forward" and "Reverse" buttons be depressed simultaneously. Low voltage at push-botton control station is another operator safety feature announced. Trolley is available as a factory installed unit in combination with any model of Series 600 Load Lifter electric hoist or can be purchased separately in kit form for adaptation to existing hoists. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

26—HAND PUMP is a self-priming 20 gpm unit

This piston-type, positive displacement, self-priming hand pump delivers 20 gpm at lower cost per gallon than company's rotary vane-type hand pumps rated at 10 gpm, it is announced. Features claimed

Gardner Denver . . . Serving the World's Basic Industries

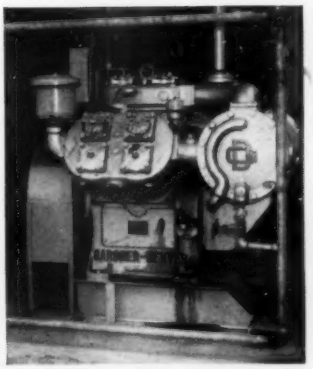


Oil-Free air with no maintenance penalty . . . Gardner-Denver Carbon Piston Compressors

Pure, oil-free air that's safe for textiles, plastics, foods, beverages, automation instruments. Low-cost air that's economical for maintenance tools and regular plant operation.

You get *both* from the Gardner-Denver CRX Carbon Piston Compressor.

Self-lubricating carbon, used for pistons and other parts, does away with any need for oil in the cylinder. Yet, user reports show that cost per cubic foot of air compressed by the CRX matches usual compressed air costs. There's no maintenance penalty—no need for two separate compressed air systems in your plant. Send for Bulletin CRC-10 today.



Another popular industrial compressor . . . the compact, efficient Gardner-Denver WB.

GARDNER - DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

For more facts circle 606 on Reply Card

Calks prevent slipping off logs, but . . .

40 steel diamonds grip every step on low cost

A.W. SUPER-DIAMOND

ECONOMY ROLLED STEEL FLOOR PLATE

Wherever slipping hazards exist, install A.W. Super-Diamond for maximum foot safety at economy price. Keys to Super-Diamond's anti-slip protection are the raised diamond figures alternately spaced at right angles and correct distances for maximum friction from any angle of approach.

A tough rolled steel floor plate, Super-Diamond can be fabricated with ordinary shop equipment. Use it structurally, as an overlay or as complete flooring.

No other floor plate can match Super-Diamond's safety, durability and easy maintenance at so low a cost.

A.W. SUPER-DIAMOND
ROLLED STEEL FLOOR PLATE

"The diamond in the rough . . . a gem of a flooring."

ALAN WOOD STEEL COMPANY
Conshohocken, Pa.

Please send A.W. SUPER-DIAMOND Booklet SD-9

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Other products: A.W. ALGRIP Abrasive Rolled Steel Floor Plate—Plates—Sheets—Strip—(Alloy and Special Grades)

For plants where oil, water and grease raise special problems of slipping accidents, we suggest a check on the special qualities of A.W. ALGRIP . . . the world's only abrasive rolled steel flooring.

For more facts circle 607 on Reply Card

NEW PRODUCTS

(Begins on page 158)

include stainless steel replaceable liner, stainless steel shaft, aluminum body and piston, corrosion-resistant valves and molded plastic bearing, and built-in strainer. Fast disassembly permits easy cleaning or reversing of flow direction, according to manufacturer. The unit is available as pump only, barrel pump, pedestal pump, or with hose and nozzle delivery. Because of its corrosion-resistant moving parts, the pump is declared suitable for handling many industrial solvents, lubes, cutting or paint oils, and soaps, maintenance liquids. Bulletin 3011 gives details. Bowser Inc.

27—REUSABLE COUPLING cuts maintenance costs

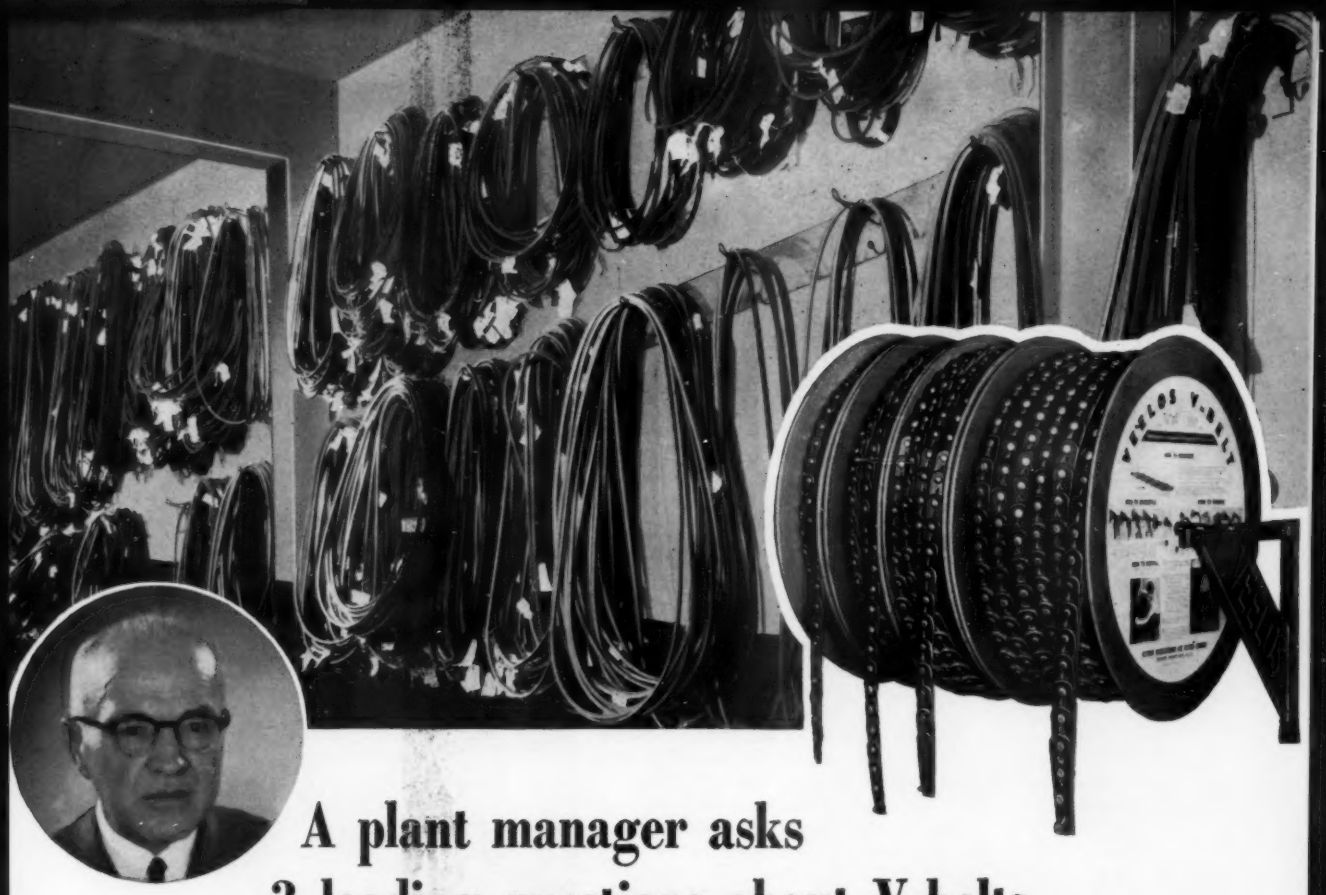
Besides cutting the cost of repair parts, this reusable coupling, the Weld-Ends, is reported to speed up replacement of transmission pipelines for sand and other solids. A non-welded type, with

clamping screws, the coupling needs no threading, company notes; you simply cut the pipe, slip on the Weld-Ends and tighten the clamping screws. The coupling can be used over again, and only the clamping screws need be replaced. In cases of severe pipeline vibration, manufacturer recommends that clamping screws be equipped with Nylok lock nuts and Shakeproof washers. The coupling comes in a full range of sizes from 2 to 10 in., and larger sizes to 36 in. Sizes to 10 in. are machined from seamless steel tubing. The Pipe Line Development Co.

28—IMPROVED VELLUM erases cleaner, faster

Blutex is a revised formulation of an established vellum, according to manufacturer, and the chief reason for its easier erasing qualities is a new combination of transparentizing materials used in treating the base stock. Blutex is treated with synthetic resins, rather than oils. The resins provide a drier working surface of unchanging characteristics, it is explained, and while dry, the paper is never brittle. It is this unusual dryness, combined with an extra hard surface, that permits faster and clean erasures, company points out. The new process also affects future erasability. The materials are formulated to resist heat and

For more facts circle 608 on Reply Card ——→



A plant manager asks 3 leading questions about V-belts

1 "I stock 85 different sized sets of belts—how can Veelos help me?"

With *four* 100′ reels of Veelos (O, A, B, C widths) you can replace as many as 316 different sizes of endless belts —and store your Veelos in *inches of space!* Veelos cuts your inventory to a minimum. No obsolescence or deterioration, no worries about specific sizes. With Veelos, your storage and inventory problems are licked!

2 "How does Veelos cut installation and down-time?"

Veelos is an *adjustable belt.* With Veelos, there's no tearing down outboard bearings, no resetting, tilting or moving motors to make belt replacement or repairs! And you don't have to replace a complete matched set because of one loose belt—Veelos belts adjust to any length, can be altered by adding or removing links!

3 "How do I eliminate costly belt vibration?"

Install Veelos in place of ordinary belts! Veelos belts are absolutely uniform; every stud and link is identical; every foot of the reel is identical and uniform; they're perfectly balanced. Your Veelos salesman can easily prove to you with a Veelos Vibration Analyzer (tested against any V-belt you might now be using) that Veelos *cuts vibration up to 90%!*

VEELOS® THE BALANCED LINK V-BELT

Veelos is known as Veelink outside U.S.A.

Get your free Veelos Data Book; many pages of important information on belt drives. Write to:

MANHEIM
Manufacturing & Belting Company
104 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

© M.M.&B. Co. 1956

Adjustable to any length • Adaptable to any drive • Balanced power • Constant power • Vibrationless power

NOW! CORROSION-FREE, HIGH-PRESSURE PERMANENT PIPING SYSTEMS

a reality with **Boltaron**

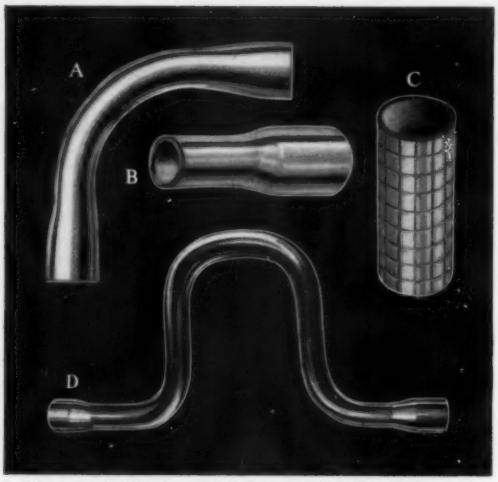
Registered Trademark, The General Tire & Rubber Co., Akron, Ohio

6200 unplasticized PVC (type I)
7200 high-impact PVC (type II)

SHRINK FITTINGS*

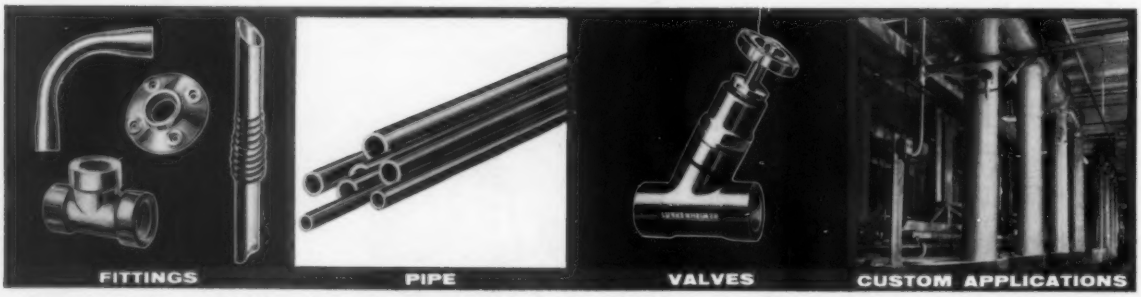
The BOLTARON Shrink Fitting*, a new concept in fitting design, utilizes the "memory" characteristic of thermoplastic materials. With the exception of couplings, both ends of the fitting are belled. The pipe is inserted into the bell which is then heated to shrink to conform to the contour of the pipe. In the case of couplings, the entire fitting is heated and shrinks in the same manner as does the bell fitting. Although the shrink process provides a very tight fit, in most cases cementing is recommended. This is done in synchronism with the shrinking by use of a special heat-curing Boltaron cement. This forms a permanent, leak-proof, air-tight mechanical bond, insuring a corrosion-free, maintenance-free, free-flow piping system with full strength of the pipe.

The Shrink Fitting* eliminates all problems of notch-sensitivity, sediment pockets, turbulence and friction losses and is most effective in long-distance and pressure piping systems.



a. Elbow b. Adapter c. Coupling d. U-bend expansion joint

To insure a uniformly effective system throughout, H. N. Hartwell also stocks a complete line of BOLTARON 6200 and 7200 PVC pipe, valves, conventional fittings and can custom fabricate additional components to meet your specifications.



Conventional fittings, shrink fittings* and roll-thread fittings in full variety of sizes.

A complete line of PVC pipe from ¼" to 6" in schedules 40 and 80.

A complete line of PVC valves in ½" through 2" sizes.

Corrosion-resistant PVC rods, blocks, sheets or pipe that can be fabricated to your specifications.

For additional information, contact:

H. N. HARTWELL & SON, INC.

Industrial Plastics Division, Park Square Bldg., Box 306, Boston 16, Massachusetts

The only integrated source for Unplasticized PVC Materials

* Patents applied for

For more facts circle 609 on Reply Card

NEW PRODUCTS

(Begins on page 158)

ag'ng, it is noted, and the transparentizing lines do not fuse with graphite lines. According to manufacturer, Blutex is just as erasable after aging or repeated reproductions as when first used. Blutex samples are offered by manufacturer. Frederick Post Co.

29—WIRING BOX is small, made of sheet metal

Model 402 is announced as a small, oil tight sheet metal wiring box particularly suitable for use with flexible, liquid tight electrical wiring conduit. The size is 4 in. long by 2 in. wide by 2 in. deep. The cover has a Neoprene gasket. Captivated cover screws thread into blind holes in the box. All seams are welded and material is 14-gage steel. The box is finished in baked gray hammertone over a phosphatized surface. Hoffman Engineering Corp.

30—DUCT INSULATION made of spun mineral wool

Felted from longer, finer spun mineral wool fibers, this semi-rigid duct insulation is available in three types: plain; with an integral vapor barrier for use on duct exteriors; and Neoprene coated for use on duct interiors. Manufacturer says the Underwriters' label has been

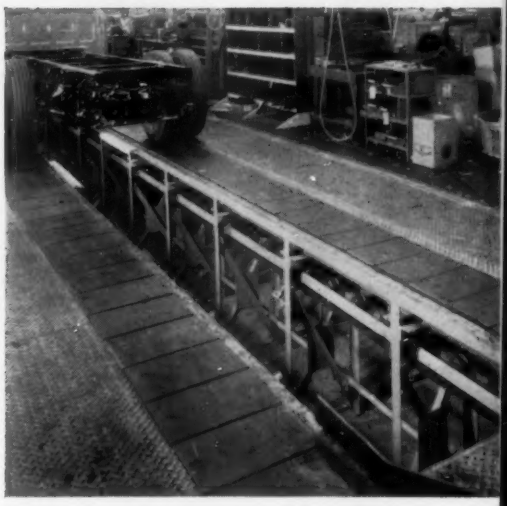
applied for on both plain and Neoprene coated types. This new insulation is not irritable to handle, it is noted, and can be cut with a knife to conform to irregularly shaped or curved surfaces. Composed of non-cellular, spun mineral wool, the material does not absorb moisture. When applied where condensation is a problem, vapor barrier type is preferred. Insulation may be applied by currently acceptable methods. It comes in 24-by-48 in. sheets with thicknesses of ¾, 1, 1½ and 2 in. It is designed to withstand temperatures as high as 450 F. Baldwin-Hill Co.

31—UNIT HEATERS offer design, styling features

Modern enclosure styling, advanced burner and heat exchanger design, light weight and a wider range of sizes are among features offered in this new line of gas-fired unit heaters. The heaters are finished in gray-green baked enamel

For more facts circle 610 on Reply Card ——→

NEW **Heavy Duty** CONVEYOR
SYSTEM HANDLES 16 TON TRUCKS



Engineered and Installed by PLANET

32,000 pound gross weight vehicles are moved with ease on the assembly line conveyor recently designed and installed by Planet in a large new truck and bus plant. The complete Planet system includes sub-assembly lines which feed the main assembly line. This is in two units with a knife-edge type conveyor feeding onto a flat top assembly type conveyor (illustrated above.)

If you have a production problem involving the movement of parts or materials, Planet know-how and experience can help you. Write or phone today — there is no obligation.

IT PAYS TO PLAN WITH PLANET

PLANET CORPORATION
1840 SUNSET AVENUE
LANSING, MICHIGAN

- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

63

NEW "Oil-in-Motion" LUBRICATION SYSTEMS

Complete, "All-in-One" Systems with

- SPECIALLY ENGINEERED TUBE-WITHIN-TUBE HEAT EXCHANGER
- ADVANCED DESIGN BOWSER FILTRATION
- CONSTANT PRESSURE CONTROL VALVE

BOWSER Circulating Lubrication Systems protect against "down-time" production losses . . . save costs of bearing replacement caused by inadequate lubrication. Each Bowser 'CS' System is supplied as a *complete unit* . . . entirely assembled, including all piping.

Special tube-within-tube heat exchanger is standard, but where cooling load is unusual, mechanical refrigeration or evaporative cooler can be supplied.

Superior filtering system removes all contaminants . . . assures constant supply of *clean* oil which has "washing" as well as lubricating effect on bearings.

System control valve maintains uniform pressure in supply line and relieves any pressure build-up which might occur . . . assures continuous supply of oil under *constant* pressure.

BTR

BOWSER TECHNICAL REFRIGERATION

DIVISION OF BOWSER INC. • TERRYVILLE, CONNECTICUT

Please send me your bulletin on 'CS' Circulating Lubrication Systems.

NAME .....

COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

For more facts circle 611 on Reply Card

NEW PRODUCTS

(Begins on page 158)

with chrome diverter grilles and trim. Stainless steel burners are used for maximum resistance to rust and corrosion. Burner ports are knife-sharp to resist lodging of dirt or scale, it is noted, and each elongated port has four times the free area of most drilled ports.

Heat exchangers are available in stainless or aluminized steel. Each exchanger tube is individually and directly fired with a flame continuous from front to rear to increase radiant heat absorption and distribute heat more uniformly. Combustion air inlets are directly beneath each tube. Light weight of these heaters affords easier installation and lower shipping costs. Lower speed motors and new fan design coupled with resilient motor mountings contribute to quieter operation. Bulletin 656 contains sizes, performance data. Modine Mfg. Co.

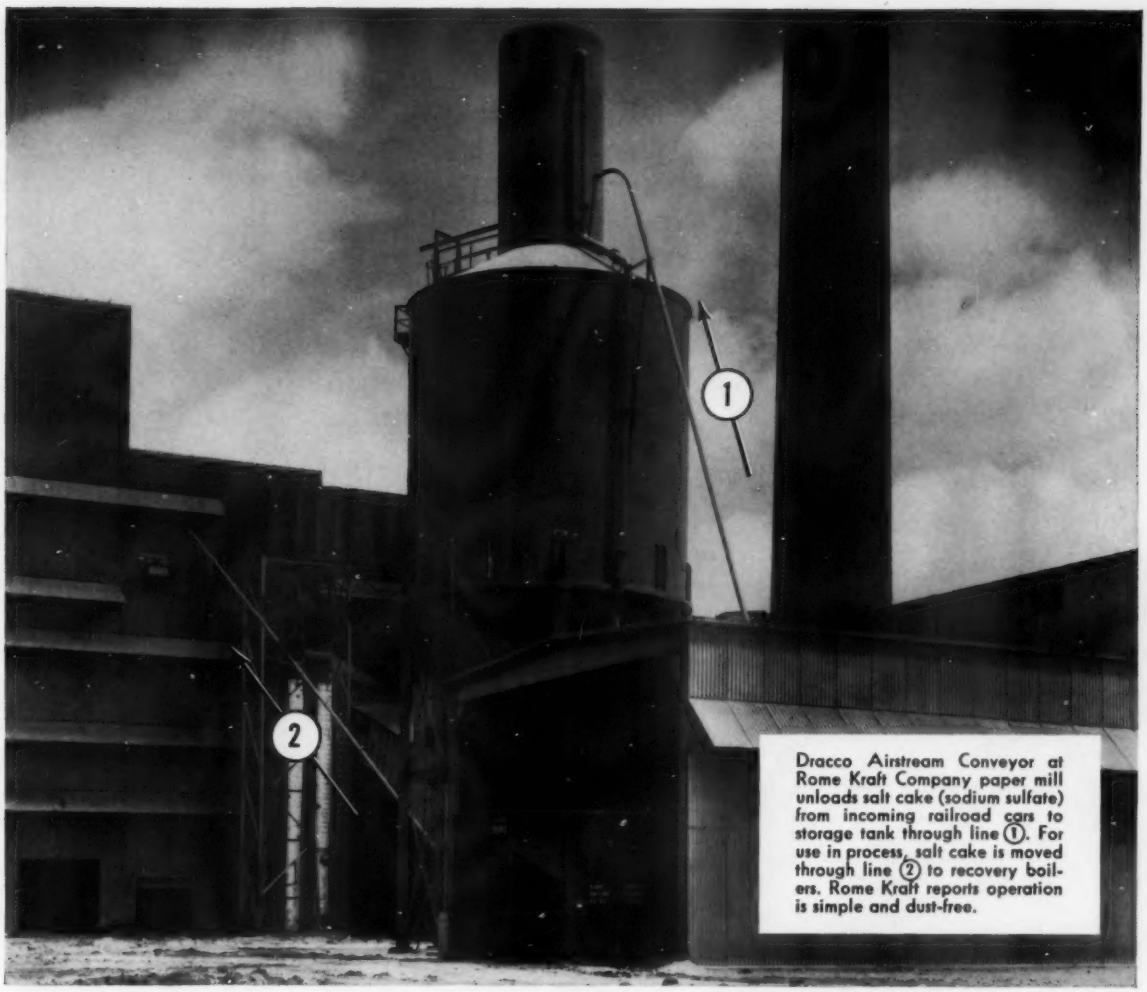
To receive product data circle item numbers on the handy Reader Service Cards provided on pages 227-228.

32—CENTRIFUGAL PUMP for fluctuating volume, head

Model BL Centrifugal Pump is designed for handling a given head and volume of water at peak efficiency, even when changing conditions of the applications vary the head or volume handled. Pump is said to provide high efficiency over a broader range of service conditions. Each size of the BL handles a wider than usual range of pressures and capacities and each will accommodate fluctuations in either pressure or capacity without serious loss of efficiency. The BL is available in five sizes of 2, 3, 4, 5 and 6 in. Each size is designed with heavy-duty ball bearings, factory lubricated to minimize lubrication troubles. Each size has an extra large shaft to maintain perfect alignment, and a strong supporting frame, as well as a trouble-free mechanical seal which replaces the stuffing box. Gardner-Denver Co.

33—SPRAYER ATTACHMENT for power machines

It takes only 40 min to spray two acres of lawn or undeveloped area around industrial and commercial buildings with the XL Sprayer Attachment for this company's Champion and Junior Tractors, according to manufacturer. Equipped with optional front boom assembly, sprayer can be set to cover a path up to 14-ft wide. Its volume is synchronized with tractor's forward speed so that machine automatically meters correct amount of spray needed. A metal drift shield is available to keep spray from plants. The XL is provided with a hand spray nozzle and 25 ft of hose



Dracco Airstream Conveyor at Rome Kraft Company paper mill unloads salt cake (sodium sulfate) from incoming railroad cars to storage tank through line (1). For use in process, salt cake is moved through line (2) to recovery boilers. Rome Kraft reports operation is simple and dust-free.

one Airstream Conveyor does two handling jobs

The Dracco Airstream Conveyor recently installed by the Rome Kraft Company, Rome, Georgia, performs two separate handling functions. First, salt cake is unloaded from railroad cars to storage; later, when required, it is conveyed from storage to process. Both operations are economically handled by one conveyor —with materials moved by air at 10 tons per hour.

This versatile, low-cost handling is typical of Dracco Airstream Conveyors —the modern method for moving all types of dry, bulk granular, or powdered materials. Air conveying of chemicals, foods, plastics, grains and hundreds of other materials is fast and safe. There is no costly manual handling and one-man supervision is normal. Buying materials in bulk provides added savings.

Dracco Airstream Conveyors can load and unload, distribute to process, transport between plants, and weigh, blend and batch automatically en route. There is no dust, no material loss from spillage or broken bags, no spoilage from moisture and contamination. Their self-cleaning feature permits sanitary handling of foods, allows quick switchover to other materials without intermixing. Systems require minimum space, can be installed in any new or existing plant.

In all these ways, air moves materials better. And *no one moves air better than Dracco.* On your next bulk handling problem, call in Dracco for a cost-saving solution. Write for literature today.

DRACCO CORPORATION
4035 East 116th Street • Cleveland 5, Ohio

FREE! THE DRACCO ENGINEER. Describes Dracco solutions to many bulk materials handling and dust control problems—includes tips on improving plant efficiency . . . published quarterly. Get on the mailing list. Write on your letterhead today!

DRACCO *Performance Proved*
Airstream **CONVEYORS · DUST CONTROL EQUIPMENT**

For more facts circle 612 on Reply Card

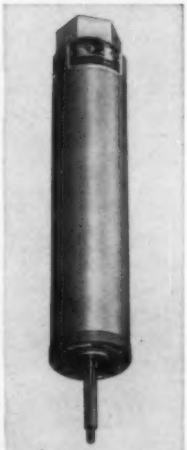
NEW submersible pump motor!

LELAND announces a new, fully U. L. Approved 60-cycle pump motor that prevents vapor-lock!

New, higher octane, more volatile gasolines pose a serious problem of vapor-lock. Or *did*. For Leland has developed a completely new submersible pump motor that allows both motor and pump to be placed right *in* the gasoline storage tank.

Leland's new explosion-proof pump motor actually uses gasoline itself for both lubrication and cooling... installs in existing tanks. In development and under field test for more than six years, it represents as great a step forward as did the *first* gasoline curb pump motor to receive U. L. Approval—developed by Leland over 30 years ago.

There's good reason why Leland gasoline pump motors *outsell all others combined*... why for explosion-proof motors of any kind, your best move is to Leland. Write, wire, or phone us today.



Leland's new 60-cycle submersible gasoline pump motor, ¾ hp, 230 V, 3450 rpm, only 3½" in dia., 17" long.

Another AMF Product

LELAND MOTORS

THE LELAND ELECTRIC COMPANY

Dayton 1, Ohio

Division of AMERICAN MACHINE & FOUNDRY COMPANY

For more facts circle 613 on Reply Card

NEW PRODUCTS

(Begins on page 158)

for use on shrubs, bushes, weeds and climbing plants. Roller-type pump will maintain effective pressures, company states, and rollers are of nylon. Ten-gal capacity tank is made of 14-gage steel. Jari Products, Inc.

34—FILTRATION UNIT for continuous operation

The Vac-40 Vacu-matic Filter—automatic and self-cleaning—is for use on grinders, hones and other machine tools where continuous and effective filtration of coolants is desired. It employs vacuum rather than gravity and is declared capable of delivering high flow rates in sustained operation. Using a specially-fabricated paper as its filtration medium, Vac-40 is said to deliver dry sludge with

no coolant carry-over. Filter medium is supported by an endless fabric belt which in turn is carried on a wire mesh belt, which revolves continuously on a chain-sprocket drive. Dirty coolant flows by gravity from a baffled distributor on to filter paper and is distributed over the paper surface. Clean coolant drains into sump, and is then delivered back to machine tool by the supply pump. A liquid level sight glass lets operator determine coolant level.

Solid particles removed from coolant are deposited on paper, and when caked so thick that suction can no longer be maintained through the belt, belt is automatically indexed forward by a vacuum switch to provide new filter area; previously collected sludge and dirty paper are discharged into unit's tote box. Vac-40 is also provided with automatic overflow. Should there be a temporary loss of vacuum or clogging of unit, pump continues to deliver coolant to the work. Unfiltered coolant is thus by-passed back to the work. Industrial Filtration Div., U. S. Hoffman Machinery Corp.

35—GLUE bonds new concrete to the old concrete

Pree-Mix Concrete Glue is described as a plastic adhesive which is water soluble in liquid state, yet dries to a waterproof, acid-resistant bond. Tests are reported to show successful use in repair of broken, cracked surfaces, steps, sidewalks, and floors, and without roughing up the old surface. The glue is packaged in pint, quart, gallon and 5-gal sizes. It is claimed heat-resistant, acid-resistant and non-toxic. In patching concrete, a pint of the glue is recommended for every sack of cement used—part of the glue

HOW CHAS. PFIZER & COMPANY, INC., WORLD'S LARGEST PRODUCER OF ANTIBIOTICS USES FAULTLESS CASTERS

Chas. Pfizer & Co. antibiotics are blended in stainless steel blenders, in sterile workrooms. Sterile conditions must be maintained for both personnel and equipment. Equipment as shown at right, must undergo *periodic heat sterilization and cleaning* and yet must function properly after this type of treatment. Pfizer engineers selected Faultless 931-5, Double Ball Bearing Swivel Plate casters for use on their portable equipment because large diameter raceways and dust-proof construction assured dependable performance under exacting conditions. 5" diameter, Plaskite Wheels were chosen because of their non-sparking and chemical-resistant features. They also have non-marking qualities which protect the ceramic and asphalt tile floors used throughout this plant.

SERIES 900 DOUBLE BALL BEARING SWIVEL PLATE CASTER

900 Series is a rugged, all purpose swivel plate caster with *two full rows* of hardened, ground and polished grade "A" ball bearings rolling around full hardened raceways. Full drawn steel horn formed for surplus strength. Complete choice of wheels to suit floor surfaces, loads and operating conditions. 900 Series shown with Renewable Rubber Tired Wheel. Also available with Drawn Steel, Semi-Steel, Vulcanized, Semi-Pneumatic, Ruberex, Plaskite and Rockite Wheels.

SERIES 2400 SWIVEL STEM CASTER

In another Pfizer operation, sterilized needles and cartridges are assembled. Approximately 36 trays, containing hundreds of sterile needles, are transported on specially designed trucks to the production area where the units are assembled. Faultless 2431-5, Double Ball Bearing Swivel Stem Casters are used on these trucks. The ⅞" stem fits the stainless steel truck legs. This series Faultless caster gives the easy swiveling characteristics necessary for movement in confined work areas.

The 2400 Series Swivel introduces a new principle that completely eliminates the customary shimmying of ordinary swivel-type stem casters. Two complete rows of balls operating in lubricated, hardened raceways form the swivel bearing of this shimmyless caster. No chance for wobble. Shown with Renewable Rubber Tired Wheel.

FAULTLESS SOLVES THE TOUGH JOBS

To get the complete Faultless Caster story, simply call your local Caster Distributor listed in your phone directory, or write us today.

FAULTLESS CASTER CORPORATION
EVANSVILLE 7, INDIANA

Offices in Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New Orleans, New York, Philadelphia, Portland, Seattle, St. Louis. Canada: Stratford, Ontario

For more facts circle 614 on Reply Card

New **ACE RIVICLOR®**

Corrosion-resistant plastic piping

RIVICLOR, newest of all rigid plastic pipe, heads the list for resistance to chemicals and excellent aging characteristics . . . plus high strength, toughness and easy workability.

Riviclor is unplasticized polyvinyl chloride, specially formulated for process piping. Non-toxic, non-flammable, excellent insulating properties. Only half weight of aluminum. Never needs painting. Smooth inner surfaces give you high flow rates with low loss of head.

Approved For Use With Drinking Water

Use Riviclor for all in-plant piping of mild or strong corrosives at normal temperatures . . . for liquid lines where "sweating" or corrosive vapors are problems . . . for underground piping. Pipe, fittings, diaphragm valves from ½" to 2".

Ask for Technical Bulletin CE-56.

ABBREVIATED TABLE OF CHEMICAL RESISTANCE

ACIDS		BASES		MISCELLANEOUS			
Acetic 50%	S	Ammonium Hydroxide 28%	S	Ethyl Alcohol	S	Carbon Tetrachloride	S
Chromic 25%	S	Sodium Hydroxide 50%	S	Methyl Ethyl Ketone	U	Plating Solutions	S
Hydrochloric 38%	S	HALOGENS		Gasoline	S	Photographic Solutions	S
Hydrofluoric 50%	L	Sodium Chloride Sat.	S	Mineral Oil	S	KEY: S—Satisfactory	
Nitric 20%	S	Ferric Chloride	S	Animal Oil	S	L—Limited to certain applications	
Sulphuric 50%	S	Sodium Hypo-chlorite 5%	S	Vegetable Oil	S	U—Unsuitable	
Sulphuric 98%	S			Phenol 10%	S		
				Chlorine 5%	L		
				Alum	S		

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY

93 WORTH STREET • NEW YORK 13, N. Y.

For more facts circle 615 on Reply Card

NEW PRODUCTS

(Begins on page 158)

to be brushed on old surface and part to be added to repair mix. The glue may also be used for gluing concrete to wood, plaster, plastic, steel, glass, other materials. General Material Co.

36—COPYING MACHINE is simplified, low cost unit

The Verifax Signet Copier, a simplified low-cost photocopy machine for producing several copies of any document in a minute, is priced at less than $150 and handles material up to 8½ by 14 in. Like other models of Verifax Copiers it can be operated in ordinary room

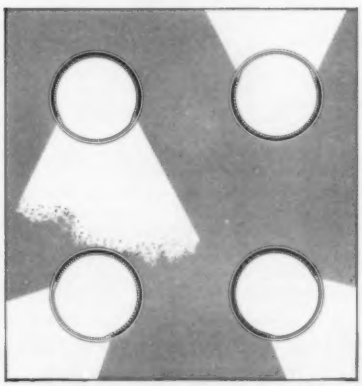
illumination. With regular Verifax copy paper, up to five or more black-on-white copies are produced at a materials cost of about 2¼¢ per copy, says manufacturer, and suitable papers are also available in card weight, in light weight for air mail use, and in blue and yellow for color coding. In this machine, a standard photoflood lamp in the lamp housing is fixed well above the printing frame. The document to be copied is slipped under an adjustable glass frame with the light-sensitive paper. An electric timer controls exposure and activation periods. Business Methods Sales Div., Eastman Kodak Co.

37—COMPACT BOILER for oil and gas firing

The Power-Pak is a compact, packaged automatic low-pressure boiler for oil and gas firing embodying engineering features of company's Powermaster units for heavier industrial use. This new boiler is designed to provide steam or hot water heating or hot water service with power demands of 10, 15, 20 and 25 hp—for the smaller buildings and for auxiliary use in larger plants. According to manufacturers, it meets ASME standards of 5 sq ft of heating surface per boiler horsepower.

It is a forced draft unit, requiring only a vent to discharge products of combustion into atmosphere. It is delivered ready for connection to power, water and fuel supplies. The burner is mounted on the boiler; the ignition transformer is mounted on the air plenum. On oil-fired models, a single motor drives

NEW Fluorescent Lamp *with Internal Reflector*



Single-pin-type lamps are extremely flexible! The lamp may be turned in any direction so that the light is directed where it is wanted.

THIS new Directional Reflector Fluorescent Lamp is the result of research on the part of Sylvania lamp engineers to give the public better lighting in industrial and commercial applications. An internal reflector coating, covering more than half the circumference of the tube, is applied between the glass and the standard fluorescent phosphor.

More relative light! The Sylvania Directional Reflector Fluorescent Lamp increases the relative light through the aperture by as much as 60 per cent brightness.

Under service installations where dust and dirt are present, this lamp will give the user a significant increase in more useful light. It is less affected by deposits of "light-stealing" dust and dirt on the top surface of the lamp.

Many advantages! Sylvania's Directional Reflector Fluorescent Lamp may be mounted without reflectors in installations with ceilings of poor reflectance. It will step up the light output of fixture reflectors that are deteriorated by age. It saves on lamp cleaning and maintenance costs, gives increased lumen hours in supermarkets and commercial establishments using bare single-pin fluorescent lamps.

The directional lamps in production are the 48-inch and 96-inch, cool white, single-pin sizes. For additional information on the Directional Reflector Fluorescent Lamp, and help with your lighting problems, contact your Sylvania Supplier, or write direct to:

SYLVANIA ELECTRIC PRODUCTS INC.
Dept. 6L-7006—Lighting Division
60 Boston St., Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, Montreal

SYLVANIA®

. . . the fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

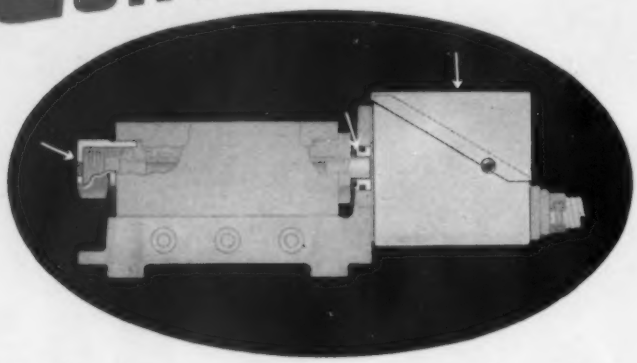
For more facts circle 616 on Reply Card

SELECT

Quick-As-Wink®

AIR AND HYDRAULIC

CONTROL VALVES



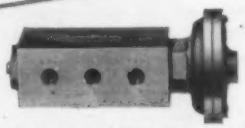
New Dust-Tight Construction

for SOLENOID VALVES

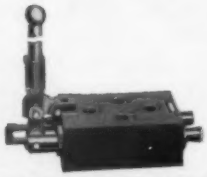
protects all operating parts from Dust and Grit

• Now you can get even greater value in Quick-As-Wink Solenoid Valves — *at no increase in price.* They've been dust proofed. A sintered bronze filter in the breather hole permits air to pass through in either direction, but prevents the entrance of dirt. A sleeve with two "O" rings assures dust-free operation where the solenoid armature contacts the valve plunger. The overlapping cover for the solenoid fits tightly but can be removed easily. It protects the solenoid even from the dust and grit blown around during "cleaning up" operations; provides ample space in which to connect the control wiring to the solenoid leads; and permits the splice to be tucked away inside the cover, not pulled back into the piping. Write for full details — *today!*

Ask us also about . . .



DIAPHRAGM OPERATED "O-TYPE" VALVE, can be actuated with instrument air as low as 12 to 15 psi.



LEVER OPERATED HYDRAULIC VALVE suited for water or hydraulic oils up to 5000 psi. 2-way, 3-way and 4-way actions.

Quick-As-Wink®

AIR AND HYDRAULIC

Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 2086 East Pershing St., Salem, Ohio

For more facts circle 617 on Reply Card

NEW PRODUCTS

(Begins on page 158)

both forced draft blower and fuel pumps. The 10 hp oil-fired Power-Pak is 61 in. long, 34-in. wide and 66 in. high; the gas-fired 10-hp model is 67 in. long. Orr & Sembower, Inc.

38—EXHAUST SILENCER for cabinet dust collectors

Intended for use wherever extra quiet operation is desired, this silencer is available to fit exhaust openings on company's 50, 60, 70 and 80 series of cabinet-type dust collectors, and the Model 122. The three smaller sizes are built of 20-gage steel and extend 30 in. above the top of the collector to further reduce noise; they cost around $20.00. The two larger sizes are of 16-gage steel, extend 36 in, and cost around $25. 00. All are rectangular in cross section and are interlined with 1-in closed cellular vinyl foam, said to absorb 80 per cent of the noise without restricting air flow. Torit Mfg. Co.

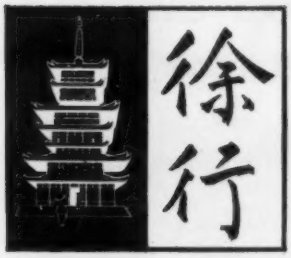
39—POCKET TOOL strips and cuts copper wire

For electrical, machine shop and other applications, this pocket-size wire cutter and stripper has a wire size adjustment

for easy wire stripping. For this, you simply set the adjusting stop to the wire size, close the jaws of the tool around the wire, hold firm and strip clean to the bare wire with an easy "straight pull" motion. The tool measures 5 in. long, weighs only 2 oz, and sells for around $2.00. Jo-El Co.

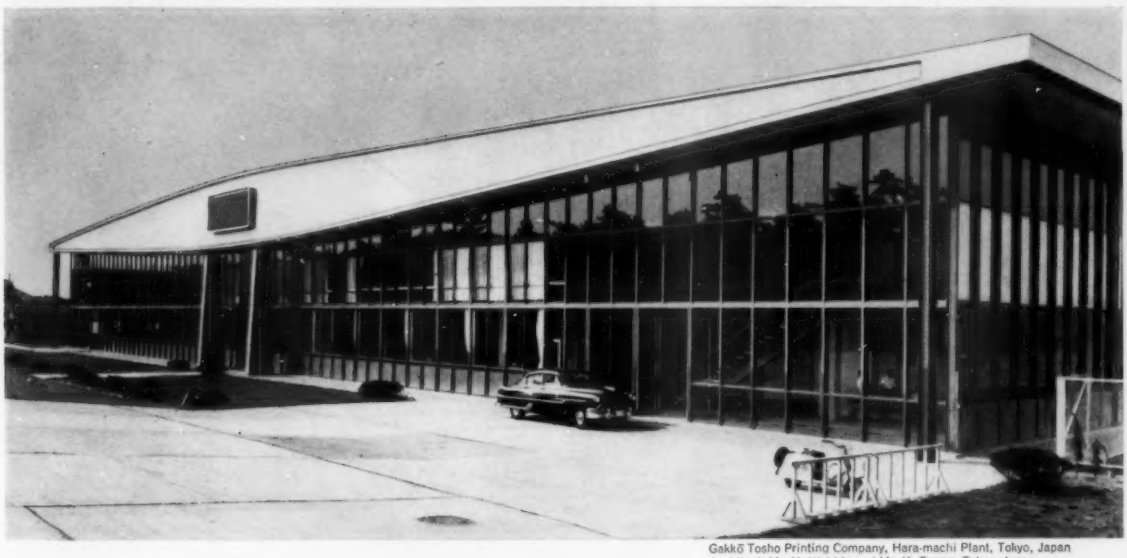
40—STUDS for construction, maintenance fastening

For use with powder-actuated tools, three new studs are designed for use where stud heads should be comparatively flush with the surface. These studs have flat heads, ⅜ in. diam, ⅛ in. thick, and thin shanks. When used in manufacturer's Model 455 Stud Driver, no extra washer or disc under the stud head is required. This feature, and the fact that the studs can be driven with 22-caliber power loads, affords a saving to the user. Another advantage announced is



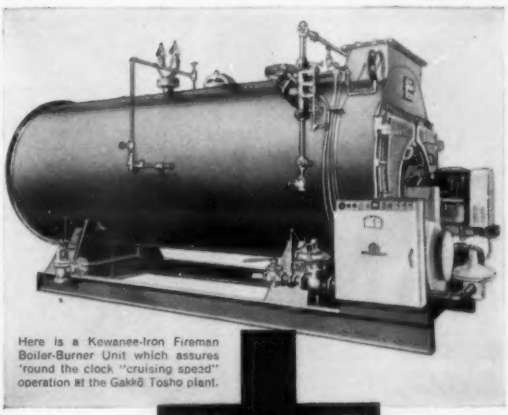
EAST MAY BE EAST . . . WEST MAY BE WEST . . .

but *"Cruising Speed"* boiler operation is best . . . *anywhere*



Gakkō Tosho Printing Company, Hara-machi Plant, Tokyo, Japan
Architect: Mr. H. Kishida and Mr. K. Tange, Tokyo, Japan
Engineer: Mr. K. Kawai, Toyohashi, Japan
Heating Contractor: Matsuhisa Industrial Company, Numazu, Japan

In Far Away Tokyo, Kewanee Boilers Were Selected by Gakkō Tosho Company Because They Provide Reserve Power to Meet Fluctuating Needs. No matter how you say it, in English or Japanese, "cruising speed" boiler operation adds up to the same thing in any language . . . higher efficiency, lower fuel cost, lower maintenance, less wear and tear, longer boiler life. And that's what management at Gakkō Tosho Company wanted in their modern Tokyo printing plant. So they selected Kewanee Reserve Plus Rated Boilers. Here they were assured reserve power to automatically supply steam quickly to operate automatic printing equipment. Reserve power in boilers means "cruising speed" operation . . . dependability . . . with enough power always on tap faster, surer. It means boilers rated on nominal capacity. Boilers rated on maximum capacity run at constant top speed, pile up maintenance and fuel costs—cut boiler life. Next time, choose Kewanee Boilers. Just call for the Kewanee man—in English, Japanese or Sanskrit—and he'll come running to serve you. KEWANEE BOILER DIVISION of AMERICAN-STANDARD, 101 Franklin Street, Kewanee, Illinois



Here is a Kewanee-Iron Fireman Boiler-Burner Unit which assures 'round the clock "cruising speed" operation at the Gakkō Tosho plant.

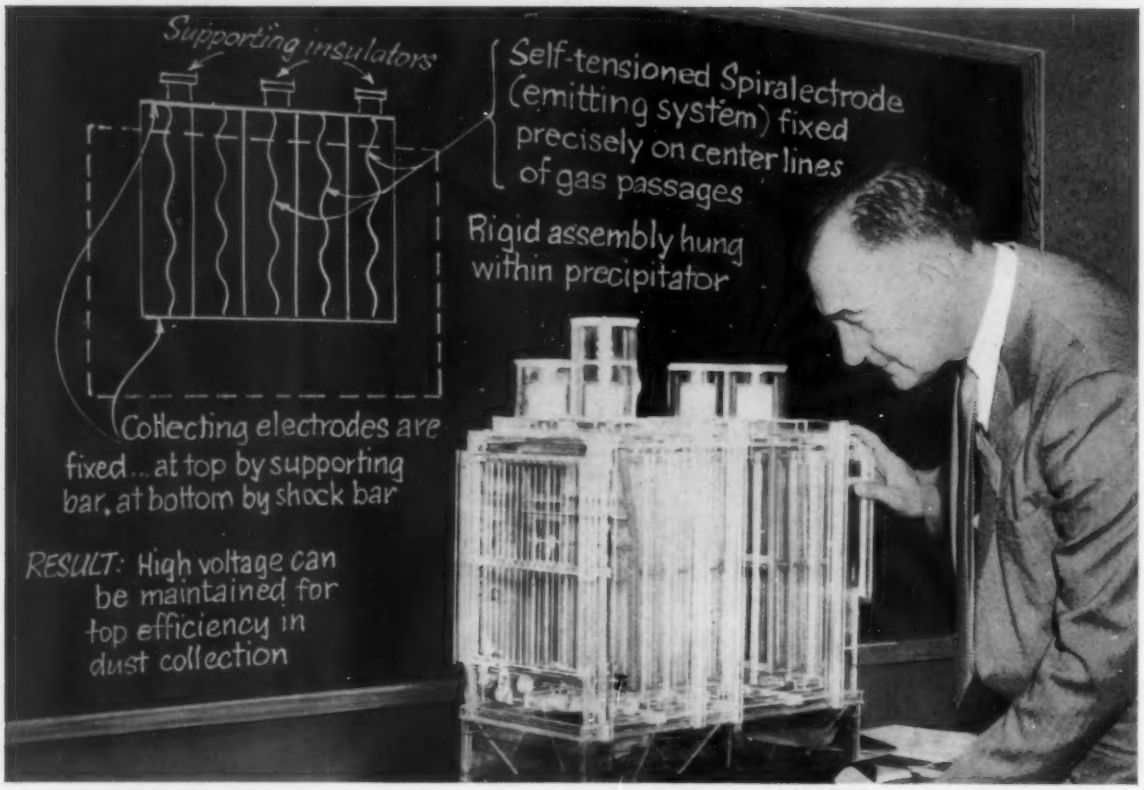
KEWANEE
reserve plus rated

KEWANEE BOILERS

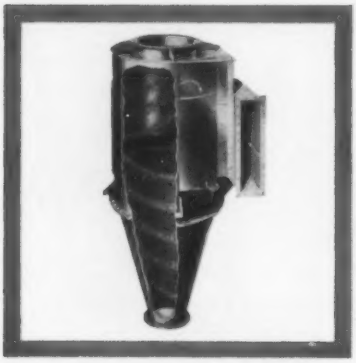
You can depend on Kewanee engineering

For more facts circle 618 on Reply Card

How fixed electrodes assure top efficiency in a Buell "SF" Precipitator

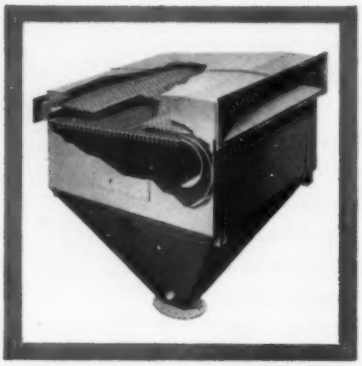

Supporting insulators
Self-tensioned Spiralectrode (emitting system) fixed precisely on center lines of gas passages
Rigid assembly hung within precipitator
Collecting electrodes are fixed... at top by supporting bar, at bottom by shock bar
RESULT: High voltage can be maintained for top efficiency in dust collection

PHOTOGRAPH OF BUELL PLASTIC MODEL BY INDUSTRY & POWER



Buell Cyclones also assure top efficiency with large diameter design to eliminate clogging . . . and by harnessing double-eddy and putting it to work.

Even when high-resistivity dusts must be collected, top efficiency is guaranteed by the exclusive shape of Buell's Spiralectrodes—proved to give 50-100% greater emission than straight wires. Exclusive Continuous Cycle Rapping virtually eliminates maintenance by keeping electrodes constantly clean.



Buell's Low Resistance Fly Ash Collector combines top efficiency to meet present strictness, with low draft loss for natural or mechanical installations.

GET ALL THE FACTS

Write to:
Buell Egineering Company,
Dept. 14-F, 70 Pine Street,
New York 5, New York

buell®

MECHANICAL ELECTRICAL

Experts at delivering Extra Efficiency in **DUST COLLECTION SYSTEMS**

For more facts circle 619 on Reply Card

NEW PRODUCTS

(Begins on page 158)

less spalling, due to the thin shanks.

One stud is 1⅜ in. long and is used to fasten metal lath, metal ducts and other light sheet metal to concrete, as well as masonry ties to concrete or blocks. Another, 2⅛ in. long, is for furring strips to concrete or blocks. The third stud is 3⅛ in. long, and is for fastening wooden two-by-fours to concrete and for shoring and form work. Remington Arms Co., Inc.

41—AFTER-FILTER BAGS of Dacron, for dust collectors

After-filter bags of Dacron cloth will now be furnished with this manufacturer's bag-equipped cyclone type dust collectors. Tests are reported to show that the Dacron cloth is as effective as wool as a filter medium; that it will not burn when exposed to a continuous shower of sparks, will not shrink when laundered, and will not be attacked by moths or mildew. Five of company's FB (bag-equipped) models will be affected by this change, but prices will stay the same as before, it is announced. Dacron bags are also available for these same models now in operation. Torit Mfg. Co.

42—PROTECTIVE SPRAY helps prevent metal corrosion

Rust Veto Spray is designed to protect all metals from corrosion merely by the pressure of a finger. In aerosol dispensers, Rust Veto is claimed effective on all types of metals, ferrous or nonferrous. Finger pressure releases a fine, even spray which forms a soft, dry and waxy film that resists oxidation. It is suggested for protecting dies, tools, polished steel, critical surfaces on important machines and equipment, hardware, others. Retail price of 16.2-oz. can is about $2.00. Krylon, Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 227-228.

43—ELECTRIC TRUCK is short and fast moving

Overall length of the K-51-AT Truck is only 67 in. to the face of the fork carriage. This short dimension is claimed to permit operation comfortably in aisles as narrow as 10 ft 6 in. The new sit-down electric lift truck is being introduced in a 4000-lb capacity model. Higher lifting and travel speeds are also announced for it. With no load it makes from 6 to 6½ mph; under load, speeds from 5½ to 6 mph can be achieved.

Materials handling is faster with the economical R-W "460"

the only completely packaged continuous power chain conveyor!

Here's an overhead conveyor designed to meet the light-load handling needs in your plant. It's the R-W "460"—a unique, continuous power chain conveyor—with three outstanding advantages: requires no special engineering; easily adapted to any plant layout; and it can be quickly installed by your own personnel.

Shipped completely packaged from stock, the R-W "460" combines unusual flexibility, convenience and safety with special economies due to lower load limits. Use it as a supplementary conveyor unit on production lines, drying ovens, washers, paint sprayers, degreasers and similar operations in which a heavy-duty conveyor is not required.

Ask for descriptive Richards-Wilcox Catalog A-96.

Shipped from stock throughout the U. S.—in easily handled packaged units. Available up to 200-ft. maximum lengths only, the R-W "460" has capacities of 8½-lbs. on 6-in. centers, or 17-lbs. per lineal foot, and 200-lb. drawbar pull.

Richards-Wilcox MANUFACTURING COMPANY
Materials Handling Division

The RICHARDS-WILCOX INDUSTRIAL & FIRE DOORS DOOR HARDWARE ELECTRIC OPERATORS "Made for each other" since 1930

Branches in Principal Cities

460 WEST THIRD STREET, AURORA, ILLINOIS

For more facts circle 620 on Reply Card

you can't check air pressure by kicking a tire

. . . And you can't check bolt tension by "wrist feel."

FREE . . .

BOOK OF TORQUE SPECIFICATIONS

Your *Snap-on* man will be glad to give you a valuable free book listing torque specifications covering all makes of cars, trucks, tractors and industrial engines. Ask for it along with new *Snap-on* tool catalog or write direct to *Snap-on*.

That's why top mechanics depend on the *Snap-on** torqometer to take the gamble out of every operation where bolt tension is specified, like take-up on main bearings, cylinder heads, connecting rods and manifold nuts.

And there's nothing to it. Set the adjustable dial at the bolt tension specified by the manufacturer and tighten until the easy-to-read pointer reaches zero or the bulb on the flash model lights.

Snap-on builds 39 torqometer models ranging in torque capacities of from 0-30 in. lb to 0-4000 ft lb and 0-35 c. kgs. to 0-280 m. kgs. Let a *Snap-on* man show you its advantages by demonstrating a torqometer on your job. He will help you choose the right model for your specific needs.

*Snap-on is the trademark of Snap-on Tools Corporation.

SNAP-ON TOOLS CORPORATION

8068-F 28th Avenue • Kenosha, Wisconsin

For more facts circle 621 on Reply Card

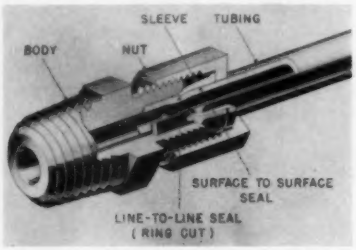
NEW PRODUCTS

(Begins on page 158)

Loads can be lifted at speeds from 25 to 30 fpm—empty forks can be raised at 45 to 50 fpm. As in all of company's electric trucks, the new model's four speeds forward and four reverse are controlled by the Magnetic Cam-O-Tractor, a time delay control. A marked reduction in steering effort is said to be achieved though a newly designed caster-wheel steer. The Yale & Towne Mfg. Co.

44—TUBE FITTING is a handy self-aligning type

Selfalign—a self-aligning tube fitting—can be installed without disassembling. The tubing is simply inserted in the fitting until it bottoms and the nut is tightened. According to company, the dual sealing principle assures positive, leakproof connections. The sleeve grips



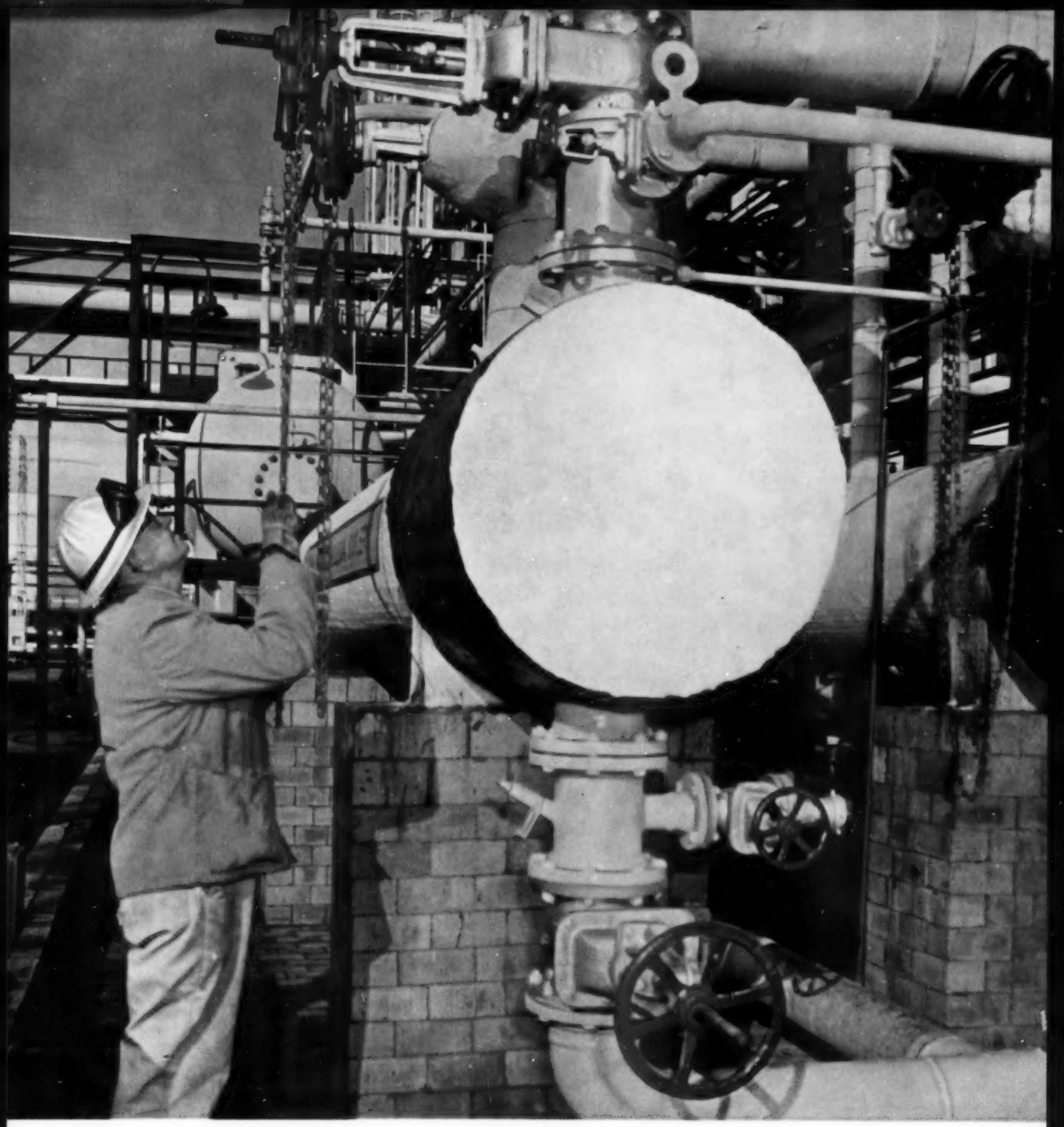
the tubing over a broad area for a surface-to-surface seal, while a thin razor edge and guiding shoulder form a line-to-line seal with the tubing as the nut is tightened. Selfalign is suited for instrumentation and all other low- and medium-pressure specifications using copper and aluminum tubing. Complete line includes union, union tee, union elbow, male and female connectors, male and female elbows, male tees for pipe on run and pipe on branch. Sizes $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$ and $\frac{1}{2}$ in. in brass are available from stock; aluminum fittings may be ordered. The Weatherhead Co.

45—TIME SWITCH features reliability at lower cost

The TSA-40 General-Purpose Time Switch, for indoor and outdoor use, is designed to turn electric circuits on or off at any time of day. It can be used for lighting, capacitor switches, heating, air-conditioning and refrigeration equipment, pump devices, and other apparatus where time control is essential. An outstanding feature announced is the shearing action of contacts which are forced to slide against each other as they open and close, preventing welding and keeping contacts clean under heavy overloads.

Unit construction of terminal block and contacts eliminates internal wiring which helps prevent hot spots and burnouts, company points out. Operator safety is increased by dead-front construction which allows adjustments to be made with terminal shield in place, without

For more facts circle 622 on Reply Card ⟶



Closing the gate on hard-to-hold hydrocarbons

At Esso Standard Oil's Bayway Refinery light hydrocarbons are used extensively at a wide range of temperatures and pressures.

Light hydrocarbons are hard to "hold," but the self-adjusting wedge design on Aloyco gate valves insures tight shut-off. Corrosion-resistant Aloyco valves – like the red-wheeled, chain-operated gate valve above – are used throughout many process units.

You'll see many more of them on key jobs at leading petroleum, processing and chemical plants throughout the country. What about your corrosives-handling problems? Write Alloy Steel Products Company, Inc., 1301 West Elizabeth Avenue, Linden, New Jersey.

6.2

Longer Lasting
ALOYCO
VALVES
1ST IN CORROSIVE SERVICE

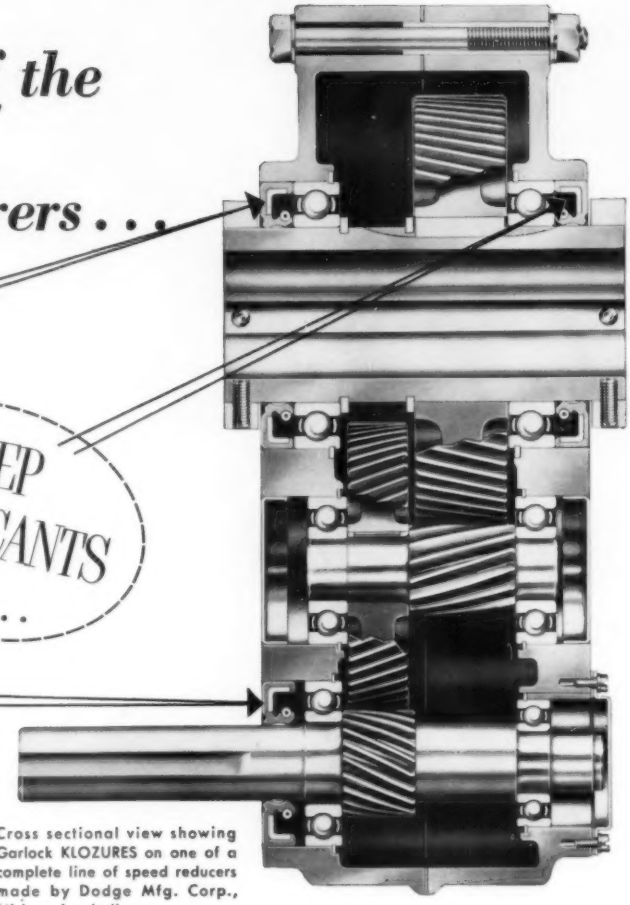
Subsidiary of Walworth Company

Over half the speed reducer manufacturers . . .

KEEP DIRT OUT . . .

KEEP LUBRICANTS IN . . .

WITH KLOZURE* Oil Seals



Cross sectional view showing Garlock KLOZURES on one of a complete line of speed reducers made by Dodge Mfg. Corp., Mishawaka, Indiana.

Makers of such fine precision products as The Dodge Torque-Arm Speed Reducer will not compromise when specifying oil seals. They know that the reputation of their entire product may depend on the quality of the oil seals they put in it.

Think about this the next time you have occasion to specify oil seals, and we think you'll choose Garlock KLOZURE Oil Seals—guaranteed to do the job you specify with minimum power loss and heat generation.

KLOZURES are available in a complete range of types and sizes. Therefore, be sure to call in one of Garlock's 125 trained sales engineers right at the start. His experience will save you time and money. Or, write today for Catalog No. 10.

**Registered Trademark*

Model 53 finger spring KLOZURE for normal and high speed service, applied to a shaft to protect the ball bearing.

THE GARLOCK PACKING COMPANY, Palmyra, New York

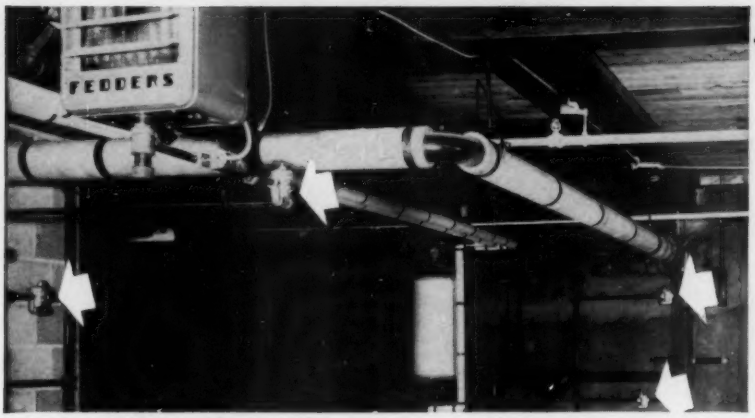
For Prompt Service, contact one of the 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints

For more facts circle 623 on Reply Card

How One Company Has Saved $80,000 to Date by Buying 600 Steam Traps



Armstrong built-in strainer traps save maintenance as well as fuel at L. G. Balfour Co., Attleboro, Mass.

Joseph Brooks, Production Manager at Balfour, insists on "Armstrongs—*no substitute.*"

Armstrong Traps on Low Pressure, Vacuum Return Heating System Cut Fuel Costs $8,000 Per Year, Have Served 10 Years Without Repairs

YOU'D HAVE TO SELL a lot of fraternity pins to come out with $80,000 profit. But, that's the dollar-saving a couple of alert plant men have made by installing Armstrong steam traps at L. G. Balfour Company, fraternity jewelry makers of Attleboro, Mass. And, they've made their own jobs easier by doing it.

Just 10 years ago, Joseph Brooks, Production Manager, and C. J. Ripley, Maintenance Superintendent, installed the first Armstrong traps on their low pressure vacuum return heating system. Now they have 600 in use throughout the plant. The results have been an engineer's dream:

1. Fuel costs reduced $8,000 annually despite doubling of the factory's size and increased prices of coal.

2. One boiler did work of two after trap installation in original plant. Steam pressure was reduced from 50-75 lbs. to 22-27 lbs. Pressure is reduced to 4 lbs., with 6"-8" vacuum.

3. No trap repairs except cleaning in 10 years and no servicing of any kind where strainers were used ahead of traps. Armstrong Y-Type strainers have now been installed ahead of all No. 800 traps and all new traps are No. 880's with built-in strainer (costing less to buy and install than separate strainer and trap.)

This story of Balfour's $80,000 profit wouldn't be as significant if it were the only one of its kind. But, the frequency of such reports about Armstrong trapping establishes firmly the tremendous cost-reduction opportunities available to many plants throughout the country—perhaps to yours. Isn't it worth looking into?

Your local Armstrong Factory Representative or Distributor will survey your trapping without charge or obligation. Call him or write:

Bottom inlet and side inlet styles for all services.

ARMSTRONG MACHINE WORKS
912 Maple Street, Three Rivers, Michigan

FREE:
44-page Steam Trap Book —a complete guide to better trapping

ARMSTRONG MACHINE WORKS
912 Maple St., Three Rivers, Michigan

Please send me a "Steam Trap Book"

Name_____

Company_____

Street Address_____

City_____ Zone____ State_____

For more facts circle 624 on Reply Card

BEFORE they start!

Avoid motor burn-outs entirely! Stop them before they start—by slipping a Twin Disc HYDRO-SHEAVE® Drive on the end of your motor shaft.

The silken "slip" of *fluid* within the HYDRO-SHEAVE —eliminating mechanical connection—picks up heavy starting loads smoothly, automatically . . . permitting motors to accelerate to normal rpm— without overheating, *without burning out!*

Only Twin Disc HYDRO-SHEAVE Drive provides exclusive *Twin-Circuit* fluid coupling design for full torque output, maximum shock absorption and less overall diameter with greater capacity.

If *your* motors are between ¾ and 50 hp, you can *improve performance,* and obtain *positive protection* of *both* motors and driven equipment by installing Twin Disc HYDRO-SHEAVE Drive.

For complete information, request *new* HYDRO-SHEAVE Bulletin 145-C today, from Twin Disc Clutch Company, Dept. DS, Racine, Wis.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
TWIN DISC
Fluid Couplings

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois
Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa
For more facts circle 625 on Reply Card

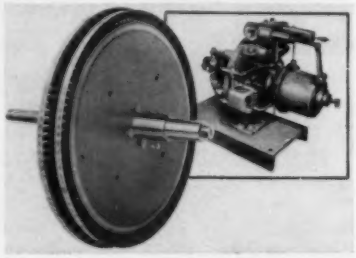
NEW PRODUCTS

(Begins on page 158)

possibility of accidental contact with terminals. Unit has a 4-w Telechron motor, designed for positive operation from —50 to 150 F and having permanent silicone-grease lubricant sealed in. Switch is furnished with either a plain dial for fixed time setting or an astronomic dial for dusk, dawn schedules. A day or more may be skipped during week's operation with omitting device. Operating voltage of the TSA-40 is 120, 240, 480 v-a-c. Frequency is 60, 50, and 25 cycles. General Electric Co.

46—TURBINE with all-steel welded rotor

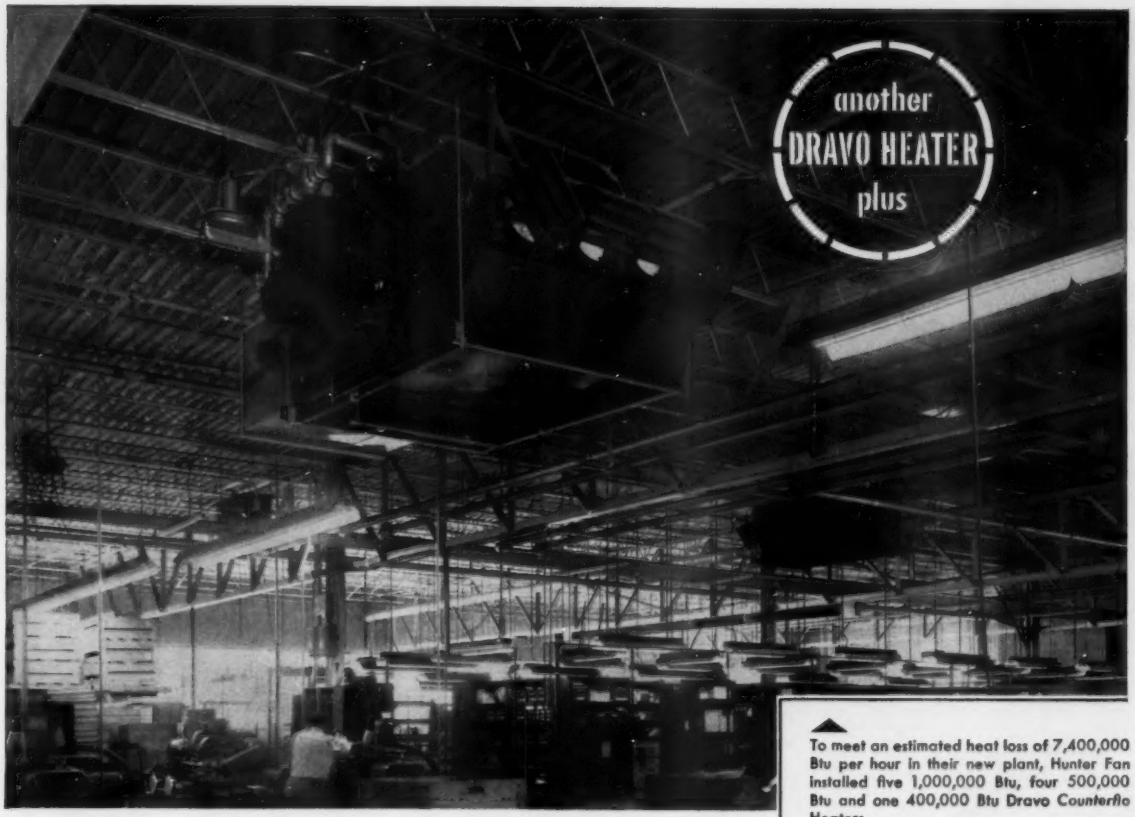
The rotor on this turbine is claimed to be one of the safest on the market. Buckets are of nickel steel, welded to the periphery of the rotor and capped by a steel shroud, also welded. It is explained that should a turbine lose its load, accompanied by governor failure,



instead of speeding up to destruction, the buckets would be released from the rotor at the weld, thus removing the steam impingement forces on the rotor. The speed at which the buckets will disengage is several times the maximum operating speed of the turbine, company points out, but well below the rotor's breaking point. It is reported that after 10 years of field tests, no rotors of these turbines have exploded, although on several occasions, whether from accident or otherwise, the turbine load may have been lost or a trip valve failed to function. L. J. Wing Mfg. Co.

47—RESURFACING MATERIAL for mechanical seals

No. 55 Facing Material is described as providing a wear-resistant, highly refractory coating of pure oxides. It is applicable to the basic seal parts made of steel, bronze, aluminum, stainless steel, Monel or other alloys. The coating is claimed highly resistant to thermal or physical shock and corrosion, and seals with a low coefficient of friction at contact surfaces. It is reported that No. 55 Facing Material retains its original micro-finish flatness and is not subject to usual strains and stresses found in many hard surfacing materials. Development and processing of this facing material was made with cooperation of



To meet an estimated heat loss of 7,400,000 Btu per hour in their new plant, Hunter Fan installed five 1,000,000 Btu, four 500,000 Btu and one 400,000 Btu Dravo *Counterflo* Heaters.

The new L-shaped factory building, 350 by 420 feet, supplies 108,000 square feet of manufacturing and storage space. Dravo Heaters meet varying heat requirements easily despite the fact that one-sixth of plant's total wall space is window area.

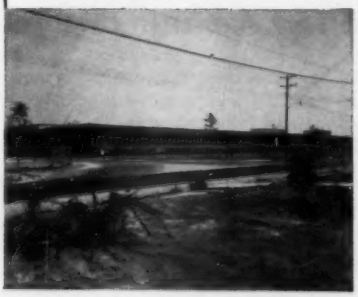
Southern factory finds economical answer to plant heating problem

Much of the South's rapid industrial expansion can be credited to its year-around sunny, mild climate. But this same climate has presented some unique heating problems to manufacturing firms like Hunter Fan and Ventilating Company of Memphis, Tennessee. Their particular problem was to provide an efficient yet economical heating system for their new factory building.

In addition to the normal heating requirements, experience indicated that "chill" conditions prevailed during many winter and early spring days, particularly in the morning hours. This "part time" heat requirement indicated the need for a conventional system that could not only handle their normal needs but also have sufficient flexibility to meet these varying demands. Specifically what they needed, Hunter plant engineers decided, was a system that instantaneously handled a wide variation of heat requirements and yet was low in initial cost, maintenance, and compact enough to fit limited space in modern, low factory structure.

As cooling and ventilating specialists, they examined and evaluated all types of heaters and heating systems. Ten Dravo *Counterflo* heaters were found to be the ideal answer to their plant heating requirements.

Regardless of your plant location—East, West, North or South—you'll be dollars ahead by carefully investigating Dravo's quality heaters to see how their many features work for over-all heating efficiency and economy every day of operation. The coupon below will bring you all of the details—mail it today!



Dravo Corporation, Department A-1306
Fifth & Liberty Avenues
Pittsburgh 22, Pa.

I am interested in Dravo Heaters for

_____

☐ Please send literature
☐ Please have a representative call

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

DRAVO
CORPORATION
Pittsburgh 22, Pennsylvania
Representatives in principal cities

For more facts circle 626 on Reply Card

Now you can get off-the-shelf delivery on corrosionproof shell and tube heat exchangers. This new type of unit, low in initial cost, costs nearly nothing to maintain.

Heat, cool, condense corrosives safely in PYREX shell and tube heat exchangers

Because they contact only glass, Teflon and ceramic materials, corrosive fluids can't harm PYREX brand shell and tube heat exchangers. These units are safe, too, for fluids sensitive to metals.

No heat flow barrier

The smooth surface of glass helps keep fluid velocity high. Less stagnant film builds up between the fluid and shell on either tube wall. And glass's smooth surface resists scale and algae deposits.

Wide versatility

The individual shell and tube units are mass-produced standard modules. You circuit the multiples you need in series, parallel or series-parallel flow combinations. You add units as demand increases or cut capacity with external manifolding when demand is down.

Built to bring you savings

Mass production gives you low first cost and off-the-shelf delivery. Installation costs are low because you need only two men and no hoists or cranes.

Two models, two sizes

You can choose the new PYREX brand shell and tube heat exchanger in either 50 sq. ft. or 13½ sq. ft. capacities in standard or regenerative types. The standard model takes corrosives on the tube side only. The regenerative takes corrosives on both tube and shell side.

Circle reader service No. for "Design Manual."

CORNING GLASS WORKS
10-6 Crystal Street, Corning, New York
Corning means research in Glass

For more facts circle 627 on Reply Card

NEW PRODUCTS

(Begins on page 158)

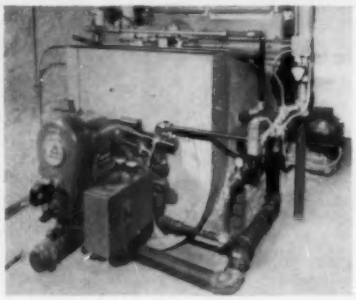
the Norton Co. Uses for it include refinery, chemical and general processing equipment. The Durametallic Corp.

48—LUBE SYSTEMS for light-, heavy-duty machines

CS Circulating Lubrication Systems are announced for providing continuous recirculation of filtered oil to bearing surfaces of light, medium and heavy duty machinery. These systems are furnished complete and consist of liquid pump, tank, filter, heat exchanger, control valve and required piping. The units have application in many fields including paper, rubber, textile, machine tool, metal rolling and other industries. Compact and inexpensive, they are reported easily installed. Bowser Technical Refrigeration.

49—WATER-WALL FURNACE steps up boiler capacity

This water-wall furnace is being offered for incorporation with user's standard burner equipment for installation on existing boilers. It will also be made available along with a horizontal rotary oil burner, as part of company's packaged



automatic Thermopak Combustion System. According to manufacturer, the basic advantages this water-wall brings to an existing boiler are: improved circulating characteristics of the boiler; longer life expectancy of existing boiler equipment; greater efficiency; reduction in combustion chamber maintenance. Preferred Utilities Mfg. Corp.

50—WIRE ROPE has extra strength advantages

Flattened strand wire rope, known as Imperial Red-Strand, is announced as 15 per cent stronger than that previously offered by company. The additional strength has a number of advantages. Greater than normal temporary loads can be handled without having to install a larger rope with accompanying equipment changes. In fact, company points out, it is sometimes possible to do a safe and satisfactory job with a smaller diameter rope than would otherwise be needed. Also on jobs where unexpectedly encountered shock loads may create a great strain momentarily, the extra

Parlon® Stays On

Meets Challenge of Chemicals

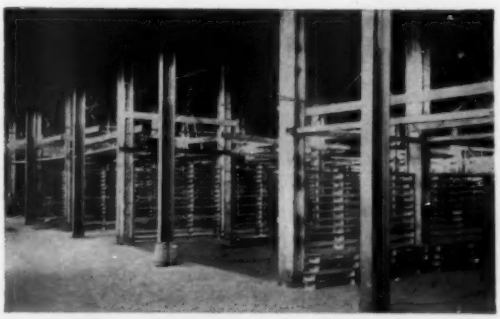
IN A VINEGAR PLANT—To protect a new vinegar-manufacturing building against the corrosive fumes of acetic acid, the interior of this plant was finished with Parlon-based Rigortex, a product of Inertol Co., Inc., Newark, N. J.

No matter how strong the corrosive challenge—whether it comes from acid, alkali or the elements—Parlon-based protective coatings are providing longer protection at lower long-term cost.

Easy to apply and quick drying, Parlon-based chlorinated rubber paints have proven themselves in actual use where other finishes have failed to provide satisfactory service. That's why—for those hard-to-protect surfaces—more and more maintenance people are turning to Parlon finishes to solve their protective coating problems.

No matter how difficult your maintenance paint requirements, chances are there's a Parlon-based coating that will meet them. For full technical data on Parlon, call or write your regular supplier of quality paint finishes or write directly to Hercules.

. . . AND A FERTILIZER BUILDING—The steel structures of this fertilizer mixing building are continually under attack from ammonia gas, nitric acid fumes, compounds containing free sulphuric acid and free phosphoric acid. To meet this challenge, Parlon-based Torex, another Inertol Co. product, was selected.

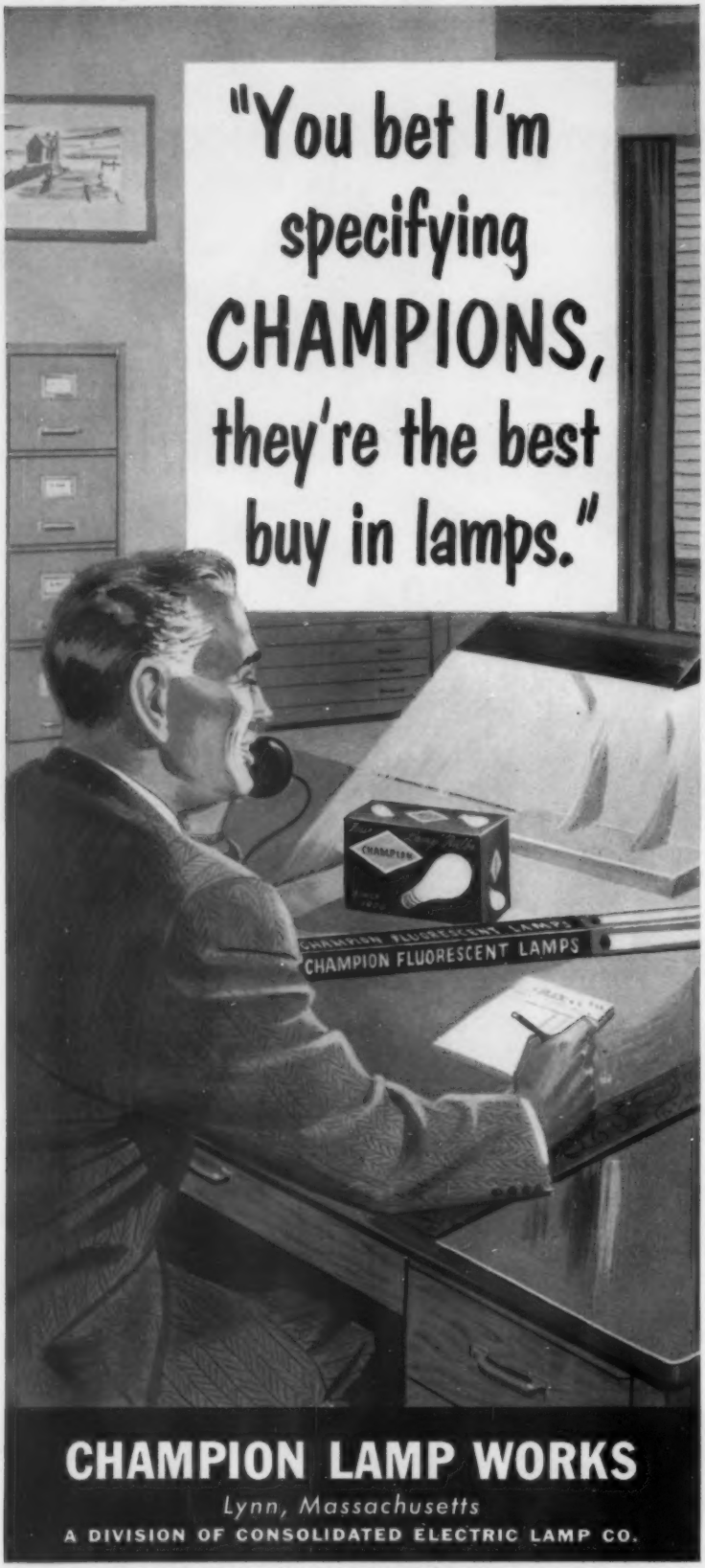


Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
966 Market St., Wilmington 99, Del.

CR56-4

PARLON (CHLORINATED RUBBER) PAINTS ARE AVAILABLE FROM 400 MANUFACTURERS UNDER THEIR OWN BRAND NAMES

For more facts circle 628 on Reply Card


"You bet I'm specifying CHAMPIONS, they're the best buy in lamps."
CHAMPION
CHAMPION FLUORESCENT LAMPS
CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

For more facts circle 629 on Reply Card

NEW PRODUCTS

(Begins on page 158)

strength rope will frequently meet the extra stress without breaking and carry the load over the peak. Leschen Wire Rope Div., H. K. Porter Co., Inc.

51—VISE LACER for the small belt hooks

The No. 1-6 in. Vise Lacer, designed for belt hooks used to lace belts from 0.060 to 0.156 in. thick, can be used in any standard vise 4 in. or larger. Hook retainer on the vise lacer has 50 slots to accommodate standard 50-hook card of the No. 1, 1-A and 1-D hooks. Lacing wide belts with these hooks previously required a special hook adapter for regular belt lacers, it is noted. According to company, it will make for easier servicing of belts on such machines as those with a 15¼-in. belt 0.070 in. thick and a 4-in. belt 0.125 in. thick. Lacer sells for about $10.00. Clipper Belt Lacer Co.

Use the Reader Service Cards provided on pages 227-228 to ask for more information on these products. Circle item numbers of products in which you are interested.

52—PUMPS with standard parts for all sizes

Only three parts—impeller, casing and back head cradle—vary with the size and capacity of the GS line of seven standard centrifugal pumps for general service and chemical service. Other parts are the same. The series comprises seven sizes ranging from 1-by-2 to 3-by-4 in. Pumping capacity extends to 600 gpm and total dynamic head to 275 ft. Pumping temperatures cover a range from –40 F to 350 F. Type GS pumps are described by manufacturer as an inexpensive quality line of standardized pumps for many applications where conditions do not require a more costly engineered pump. Practically all important features of engineered process pumps are claimed to be incorporated in this line. Dean Brothers Pumps Inc.

53—SEALING STICK for pinholes, cracks, rusty parts

Oyltite-Stik for sealing oil leaks under greater pressure and temperature has proved satisfactory for use on hot oil pipes where pressures up to 75 psi and temperatures up to 400 F are encountered, it is announced. The product seals cracks, pinholes, rusty parts in welds, etc., in oil tanks, pipes and containers of all kinds. It is furnished in handy stick form and simply rubbed across leaky area. It can be applied while oil is flowing it is noted; there is no need to drain

For more facts circle 630 on Reply Card ——→

16,700 pounds of fork lift and steel wire roll smoothly over this Multigrip protected aisle. In the past, the 2-inch-thick wooden flooring required repairs two or three times a week. In the eight years Multigrip has been on the job, there hasn't been a single hole or worn spot.

Perfect traction allows this heavily-laden fork lift to roll easily from a concrete ramp onto the Multigrip Floor Plate aisle. Even after eight years, the floor plate has shown hardly a sign of wear.

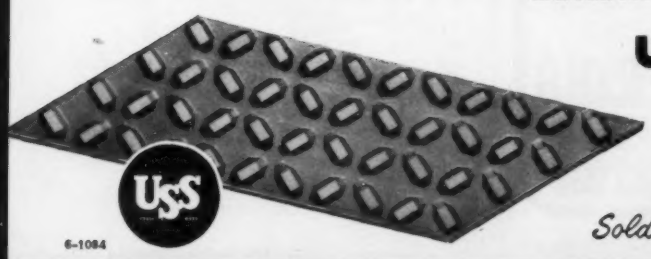
Multigrip Floor Plate solved a tough maintenance problem

How much does it cost to repair wooden flooring two or three times weekly? "Too much," said a Midwestern metal fabricating company. Fork lifts in their plant, loaded with steel wire for a grand total of 16,700 pounds, were breaking through 2-inch-thick wooden flooring regularly.

Eight years ago, 12,000 square feet of USS Multigrip Floor Plate were used to surface all aisles and ramps used by the heavily-laden trucks. To date, maintenance has been limited to replacement of a few bolts used to fasten the Multigrip to wooden flooring beneath. Installation took only a few working days, including measuring, cutting turns, laying and seam-welding. The Maintenance Supervisor says, "Since I installed Multigrip Floor Plate, I haven't had to patch a hole and haven't had to reweld seams, smooth off risers or anything. There isn't a thing except steel floor plate that could carry lift-loads of 16,700 pounds without damage."

Multigrip Floor Plate can be a plus factor on your maintenance budget, too. These tough steel plates with their flat-topped risers stay in service for years with hardly a sign of wear. They provide "safe-tread" traction for both feet and wheels, even when wet. Since oil and grease can't possibly soak in, a broom is all that's needed for cleaning. Multigrip is available in large plates for economical installation and may be bent or formed where necessary. Make your plant safer while giving your budget a break by protecting ramps, stairs, aisles, platforms and floor areas with USS Multigrip Floor Plate.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



6-1084

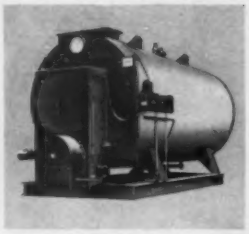
USS multigrip

FLOOR PLATE

Sold by leading distributors from coast to coast

UNITED STATES STEEL

Wherever Continental Automatic Boilers are installed, people are saving money.



Front and right side view of one of four 400 hp Continental Automatic Boilers ready for shipment to four cement products processing plants.

With a

Continental BOILER

You, too, can...

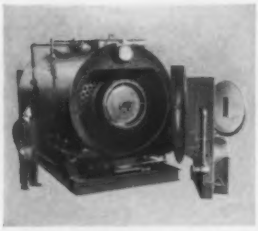
Front and left side view of same 400 hp unit — note simplicity of design.

SAVE ON INITIAL COST!

. . . for Continental Boilers are frequently *lowest* in purchase cost, yet feature highest quality workmanship, materials and controls.

SAVE FUEL COSTS!

. . . for Continental Radiant Flame Heating meets or beats other methods for fast, economical heat. And its unique "Spinning Gas Technique" affords maximum heat transfer and efficiency.



View with front doors open showing gas burner assembly.

View with rear door open— showing furnace, return tubes and refractory-lined rear door.

SAVE TIME, LABOR, MAINTENANCE!

. . . through Continental Boiler's simple, functional design that affords quick access to furnace and return tubes, easy cleaning and inspection, brief shut-down.

SAVE REPAIR AND REPLACEMENT COSTS!

Long, trouble-free service is made possible because all return tubes do equal work, affording balanced water circulation and uniform expansion.

Sizes 20 to 500 hp; 15 to 250 psi. Gas, oil or combination fired. Write for literature, and let B.E. bid on the next boiler you need.

Continental AUTOMATIC BOILERS

BOILER ENGINEERING and Supply Company, Inc.

1 Manavon St. • Phoenixville, Pa. • Phone 5832

For more facts circle 631 on Reply Card

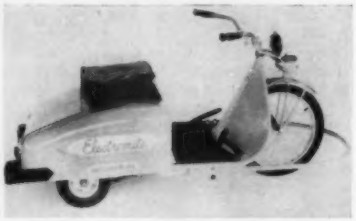
NEW PRODUCTS

(Begins on page 158)

tanks or pipes. Applications range from fuel oil heating plants, to oil-filled transformers. It is declared satisfactory for use with fuel, lubricating, vegetable or tar oils and gasoline. It is packed in a six-unit box. Lake Chemical Co.

54—ELECTRIC CAR runs all around the plant

The Electromite is noiseless and fume free and poses no fire hazard, manufacturer announces, and it will run about 5 miles for a penny. It starts at the push of a button, and has a storage compartment for mail, small parts. Running on automotive-type batteries, the



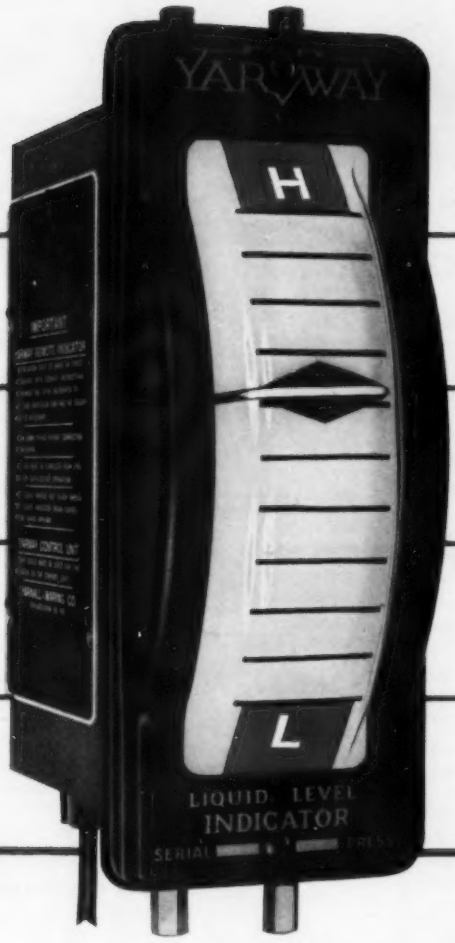
three-wheeled car has two speeds forward with a maximum of 20 mph. Speed limit can be adjusted downward to 6 mph. The built-in charger plugs into a 110-v a-c- socket and an automatic timer shuts off when charging cycle is completed. Maximum range is reported about 36 miles between charges. Under normal usage batteries are expected to last indefinitely, since they are not subject to high temperatures. The Electromite has a pressed steel body, welded seamless steel tubular frame. It is 66 in. long and 25 in. wide. It can turn around on the width of a sidewalk, it is noted, and can climb a 20 per cent grade with a 225 lb load. It weighs 190 lb packaged and costs around $350. Electromite, Inc.

55—TROLLEY CONVEYOR works in narrow aisles

This non-powered overhead trolley conveyor can be adapted easily for use in narrow aisles, it is announced; it features a four-wheel trolley which is hand pushed on a monorail. Switches and track bends are available so that horizontal directions of the system can be changed. The system is particularly suggested for use in operations where manufacturing or packing delays prevent use of a constantly moving conveyor. Rapistan-Keystone Inc.

56—EXHAUST TUBING for high temperature uses

Permanently flexible, heavy-duty, vibration absorbing flexible exhaust tubing capable of withstanding constant exhaust temperatures to 1250 F is announced. Of corrosion-resistant stainless steel, it



boiler water levels now easier to **see**... easier to **read**

Whatever the boiler pressure, high or low, YARWAY Remote Indicators give accurate, instant, eye level boiler water level readings at any convenient plant location.

Boiler Code Case No. 1155* says in part, "... two independent remote level indicators of the compensated manometric type may be used instead of one of two required gage glasses for boiler drum water level indication in the case of power boilers with all drum safety valves set at or above 900 psi ..."

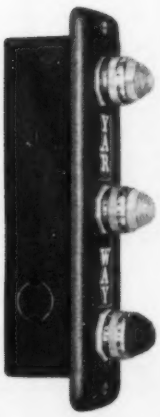
YARWAY Remote Liquid Level Indicators fill the bill—and feature a "wide vision" face that makes reading easier from any angle.

Accurate—because indicator is actuated by the boiler water itself—by the pressure differential between a constant head and the varying head of water in the boiler drum.

Also use YARWAY Remote Indicators on heaters of various types.

For full description, write for YARWAY Bulletin WG-1824.

*Write for free reprint of case description.



Yarway Remote Hi-Lo Alarm Signals—lights or horns—can be used with Yarway Remote Liquid Level Indicator and placed at any location in the plant.

YARNALL-WARING COMPANY

145 Mermaid Avenue, Philadelphia 18, Penna.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY REMOTE LIQUID LEVEL INDICATORS

For more facts circle 632 on Reply Card

I don't know how the **Angel Gabriel** would have written this advertisement for **DETECTO** Scales

Mack Rapp, vice-president of DETECTO's industrial division, talked to me for three solid hours about DETECTO precision-engineered scales. Next day he talked for five hours more.

From this mass of information, I sat down to write the copy, emphasizing that DETECTO is a great name in industrial weighing equipment, which offers values to the scale user no other company can give.

For instance—the all-steel construction and all-steel lever system (not cast iron) which assures longer, trouble-free scale life and less maintenance cost.

Also the unique outboard bearing design which prevents platform tipping. This means that you get completely accurate weighing on any part of the scale.

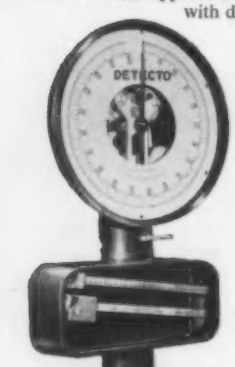
And finally, DETECTO'S tare and weigh beams that extend the dial capacity 125%. This means you get greater gross weighing with minimum dial graduations.

Well Sir, Mack Rapp agreed with everything I wrote, but he rejected the approach. He wanted "shouting-from-the-housetops" combined with dignity—dramatic impact with reason-why logic.

What he really wants is a platoon of angels singing the praises of DETECTO, emphasizing each exclusive feature with gentle thrumming on heavenly harps.

On my word of honor, I've re-written this adv. twelve times. I don't know how the Angel Gabriel would do it—all I can say is that DETECTO is the most trusted name in industrial scales, that it has a half century reputation for dependability and sustained accuracy—that it makes models for every industrial need . . . from 1/100 oz. to 50 tons.

I hope you send the coupon so we can tell you more about how DETECTO Scales can save time and earn more profits for you!



Fine Scales

Since 1900

DETECTO SCALES

SALES and SERVICE in all principal cities.

Detecto Scales, Inc.
539 Park Avenue, Brooklyn 5, N. Y.

Gentlemen:

Please send me catalog #651 describing DETECTO precision industrial scales. This, of course, obligates me in no way.

Name.....

COMPANY.....

City.....Zone.....State.....

For more facts circle 633 on Reply Card

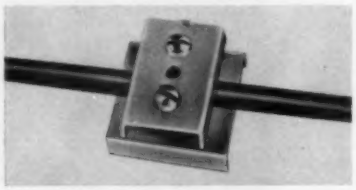
NEW PRODUCTS

(Begins on page 158)

will come in two types. Type U-140-S incorporates a soft copper wire packing which functions to plate the interlocking flexible tubing joints while in use to provide maximum flexibility under extreme vibration and high operating temperatures. Type U-120-S, of similar construction, does not have a copper wire packing and therefore is lower in cost, yet reported highly efficient. Universal Metal Hose Co.

57—CASING CLAMP for flexible remote controls

This casing clamp is designed to take all flexible control casings from $\frac{3}{16}$- to $\frac{7}{16}$-in. diam. The clamp can be used at



both the control ends and at intermediate positions; it is mounted with two screws. Construction is all steel, cadmium plated. Clamps are available completely assembled or as separate stampings. According to manufacturer, they are specially designed for flexible control casings and are not recommended for clamping tubing or electrical cables. Arens Controls, Inc.

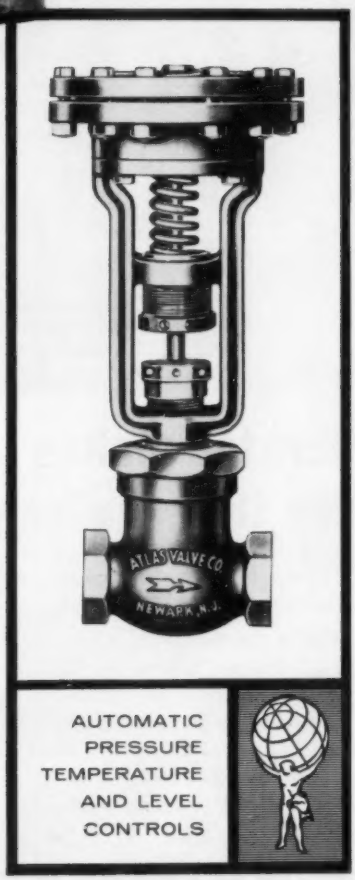
58—POLISHING WHEELS for hand-tool applications

Small PG Wheels for polishing metal with portable hand tools, have the same basic design as company's larger ones introduced previously. They are composed of die-cut pieces of coated abra-

sive cloth, bonded with resin and locked into a hub. Manufacturer believes them particularly suited for work in appliance, stainless and sheet steel fabricating, metal polishing, plating and other industries, replacing small set-up wheels. They are intended for rust or dirt removal, blending patterns left by disc sanders, weld polishing, and similar operations.

These wheels are reported especially suited for polishing soft metals because the coated abrasive cannot become filled. Mineral grains and backing wear away together it is explained; and this action assures a constant polishing pattern, since grains do not become dull

When a friend in need measured .44



AUTOMATIC
PRESSURE
TEMPERATURE
AND LEVEL
CONTROLS

When many a man, good and true, packed an "equalizer" just to feel dressed . . . Atlas turned its engineering sights to budding industry. Automatic pressure, temperature and level control valves of every description and for every need were designed and built to meet highest standards. Undiminished in reputation, unsurpassed in economy and quality, today's modern Atlas family of automatic regulators is a familiar member of the industrial team. When you call on Atlas you are loading-up with timely know-how uniquely ours.

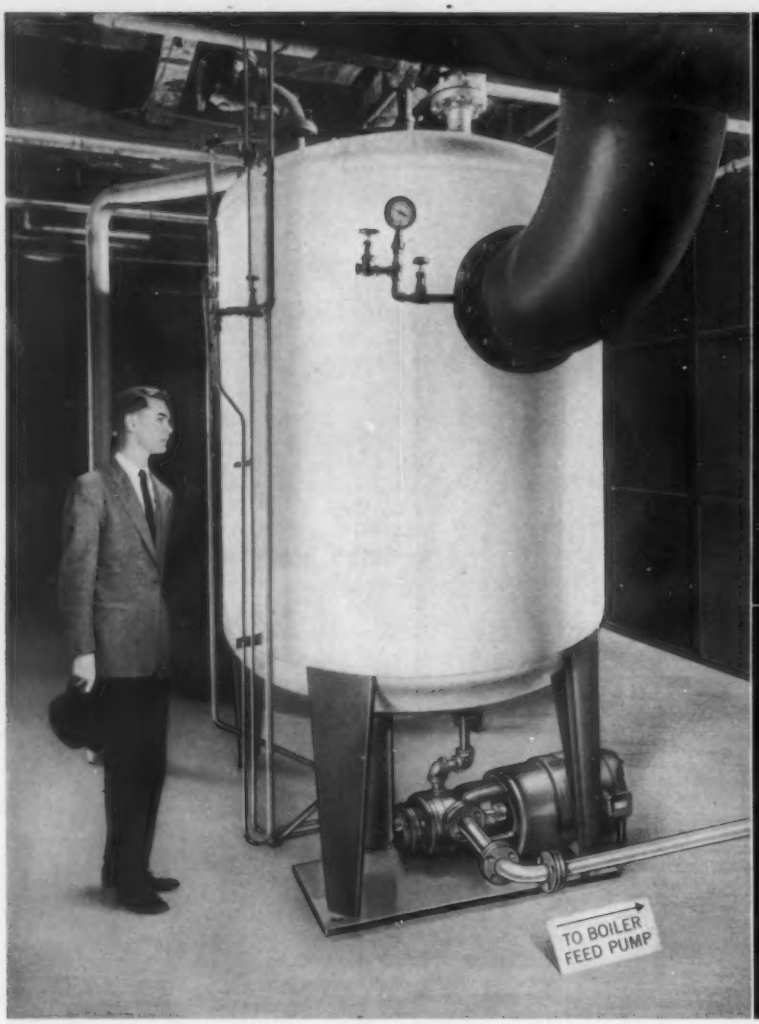
For the full story, write for our new condensed catalog 56 C.

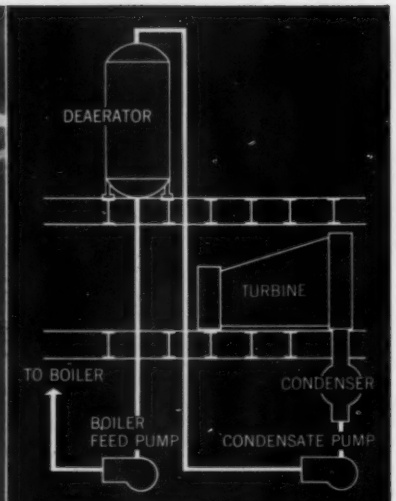
ATLAS VALVE COMPANY

280 SOUTH STREET • NEWARK 5, N.J.

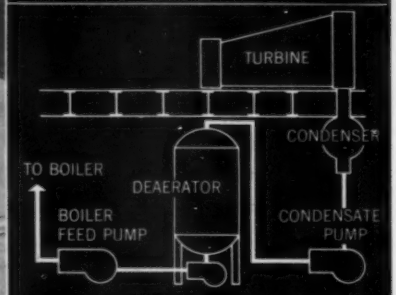
Representatives in principal cities of U.S. and Canada

For more facts circle 634 on Reply Card





NORMAL DESIGN requires expensive elevated construction and extensive piping.



NEW LOW-HEADROOM DEAERATOR can be placed on level with boiler feed pump at great saving in installation expense.

New low-headroom deaerator makes oxygen removal economical for the smaller plant

Now every plant, large or small, can cut steam plant maintenance . . . and do it economically . . . by using deaerators. A new "low-headroom" deaerator, just developed by Worthington, allows you to install the unit *inside* your power house. You don't have to pay for expensive elevated mounting and complicated piping!

To provide adequate water pressure, it used to be necessary to elevate the deaerator above the boiler feed pump intake. A small pump on the new "low-headroom" unit now furnishes this pressure without the need for elevation. Result: considerable saving on installation and piping.

A patented* recirculation system prevents vapor-binding and provides means for preheating and deaeration before start-up. It gives you maximum oxygen removal even under abnormal operating conditions.

Available in standard sizes up to 80,000 pounds per hour, and larger in "tailored" designs, the new "low-headroom" deaerator can be installed in your plant in a matter of weeks. For more information call your nearest Worthington District Office or write Section S63, Worthington Corporation, Steam Power Department, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

S.6.3

WORTHINGTON

*Patent No. 2308719-20 & 21 2564583 — other patents pending

For more facts circle 635 on Reply Card

NEW PRODUCTS

(Begins on page 158)

and rate of cut is constant. The wheels are designed for use on portable grinders, flexible shaft equipment or small bench-type grinders. They come in 6- to 10-in. diam with 1- to 3-in. face widths; and in an 11-in. diam, with 2- to 3-in. face widths. They are made with aluminum oxide or silicon carbide mineral on cloth backing, in grits from 50 to 320. Minnesota Mining and Mfg. Co.

59—DOCK LEVELER has hand operated retractable lip

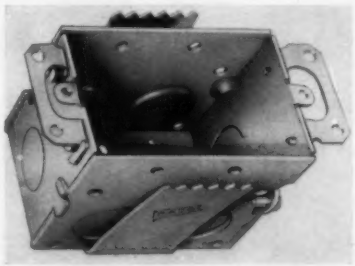
The new Power Dock 8000 is distinguished from those in company's 7000 series in that the retractable lip feature is manually operated. The lever is removable. The new model is a self-contained unit, with automatic floating action. Load capacity is 20,000 lb when lip is supported by road truck or in level-lock position. This model has an up-and-down limit of 24 in., 15 in. in-and-out. Hartman Metal Fabricators, Inc.

60—FORCE INDICATORS with capacities to 200 lb

These force indicators have capacities of 50, 75, 100, 150 and 200 lb. Designed for easy hand operation or for use in permanent test set-ups, the Series D Force Indicators are declared capable of measuring forces up to their maximum capacities with accuracies of ¼ lb for the 50-lb model, ½ lb for the 75- and 100-lb models and 1 lb for the larger ones. Equipped with compression head and hook, both removable for substitution of special fittings, the units are constructed of cold-rolled steel. Detachable, heavy-gage stamped handles latch into position and three threaded holes are provided in the back of case for mounting in test set-ups. Hunter Spring Co.

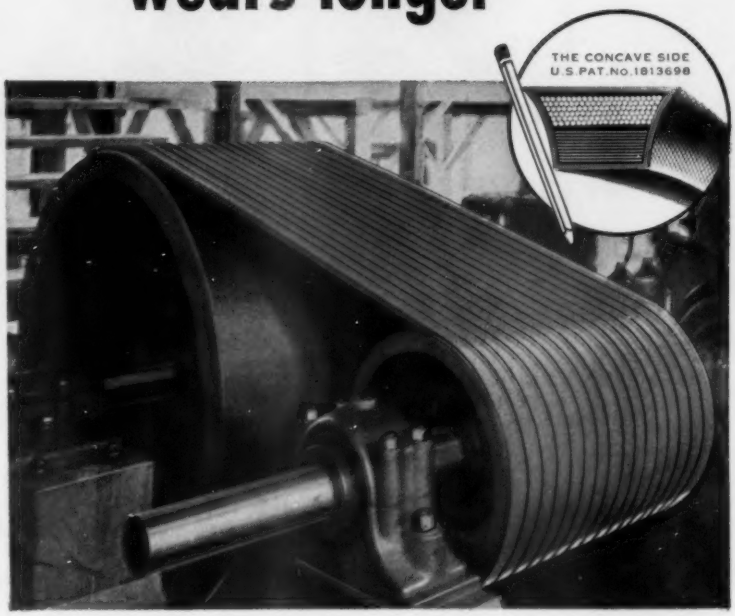
61—SWITCH BOX for installation on old-work jobs

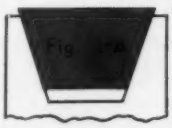
Designed for rapid, easy installation on "old-work" jobs, the Raco Griptite Box can be used on any type of wall, it is



noted—wood, wallboard or plaster. It is made of heavy gage metal and anchors by means of a wing-type support with one-screw adjustment. Manufacturer says it is the easiest box to set in place, only three simple steps are required for installation. All-Steel Equipment Inc.

Why a V-Belt with CONCAVE SIDES wears longer





It is easy to demonstrate to yourself why the concave sides (Fig. 1) of the Gates belt greatly lengthen belt life.

Simply bend a Gates belt and feel the sides. Notice how these precisely engineered concave sides *fill out* on the bend and *become straight*. Thus a Gates belt grips the sheave groove evenly (Fig. 1-A) and wear is distributed uniformly across each side of the belt. That means longer belt life; lower costs.

Make the same test with a straight-sided belt (Fig. 2) and see what happens. The sides bulge out on the bend (Fig. 2-A) concentrating the wear at points shown by arrows.

To assure longer wear and keep belt costs down, specify the V-belt with Concave sides—Gates Vulco Rope . . . readily available from nearby distributor stocks. The Gates Rubber Company, Denver, Colorado—*World's Largest Maker of V-Belts.*

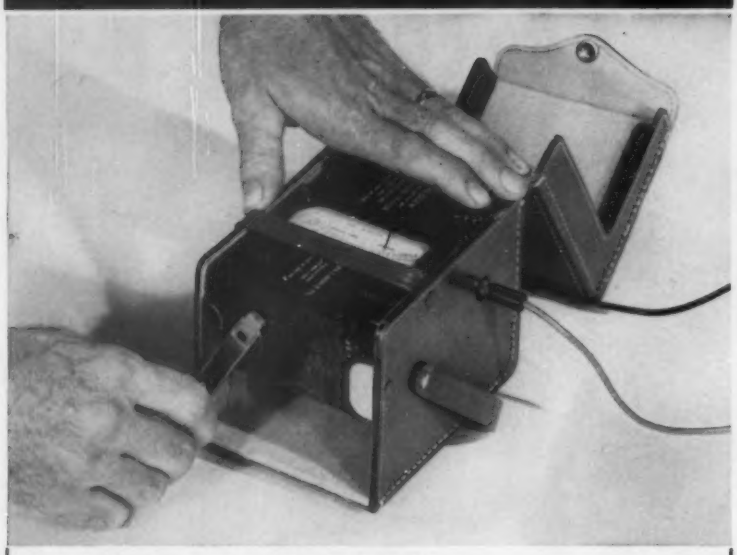
There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA 90

Gates VULCO ROPE Drives

For more facts circle 636 on Reply Card

BIDDLE *Instrument News*



A MIDGET MEGGER® MAKES A BIG DIFFERENCE IN MAINTENANCE PROBLEMS

The operating span of electrical equipment can be shortened considerably by accumulations of *dirt* and *moisture*. If no attempt, or only infrequent attempts are made to check equipment, trouble is sure to result—and at the most inopportune time.

Only by periodic insulation resistance measurements can you be sure of the condition of electrical insulation in your machines. Test with a dependable Megger Insulation Tester and keep records of each piece of equipment.

Take advantage of Summer vacation shutdowns to locate all the weak spots in your important electrical equipment.

For Convenience and Protection . . .

MIDGET "MEGGER" INSULATION TESTER

Operated without Removing from the Case

The Midget Megger Insulation Resistance Tester is a compact and rugged little set for detecting and diagnosing faulty insulation before serious and costly damage occurs. It is shown here in a "camera-type" leather case which permits operation without removal from case. The test leads store in the bottom of the case. For rugged shop and field use this sturdy "package" is hard to beat. Ranges up to 50 megohms, 500 volts d-c. Low cost.

Write for BULLETIN 21-85-PL

It's so easy to be sure—
JUST BE SURE IT'S BIDDLE

B610

JAMES G. BIDDLE CO.

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

For more facts circle 637 on Reply Card

To Maintain Welders, Know Them

(Continued from page 95)

creases, a supply of replacements should be readily available.

No hard-and-fast rules can be established regarding the quantity of replacement parts which should be kept on hand. Certainly, consumable parts such as contact jaws should be stocked. The type of installation and the magnitude of production requirements will govern the quantity and types of replacements to maintain. Some customers keep the equivalent of a second installation on their shelves so that they can keep down-time to a minimum. Some plants cannot afford to stop operations while minor repairs are made on equipment. Do not delay too long before replacing worn parts. Remember that the cost of down-time is usually much more expensive than the cost of replacement parts.

Trouble-Shooting

Many plants seem to be more interested in trouble-shooting and repair than in good maintenance. It is important that the procedures shown in the manufacturer's instruction literature be followed when trying to determine the cause of a failure.

Trouble-shooting is a state of mind. Some people are born with it, while others must acquire the talent. Everyone has heard stories of the born auto mechanic. He walks up to the idling motor car engine, pauses, listens for a moment, and then turns to the proud owner who thinks the engine is purring smoothly and says, "The exhaust valve in number three cylinder is sticking slightly." An overhaul proves he is right. How can he do this? Experience has taught him to have an open mind. It has also trained his eyes and ears. An open mind is needed to shoot trouble on an automatic welding installation. The man who approaches a break down with pre-conceived notions of the cause of the trouble may get into serious trouble, acquire a lot of needless work, and take twice as long to do the job.

Be methodical. Complete one test at a time before proceeding to the next. Eliminate one variable or possibility at a time. Do not change more than one factor at a time. The general order of trouble-shooting is to be sure that the process, apparatus, and fixtures are in good order. Ninety per cent of all troubles will be found in one or the other of these factors.

Controls are the last place to look for difficulty. There is a case on record in which it was reported that the arc voltage was fluctuating wildly. A number of checks and tests were made on the control, and all blame was placed on it. An ammeter in the circuit indi-

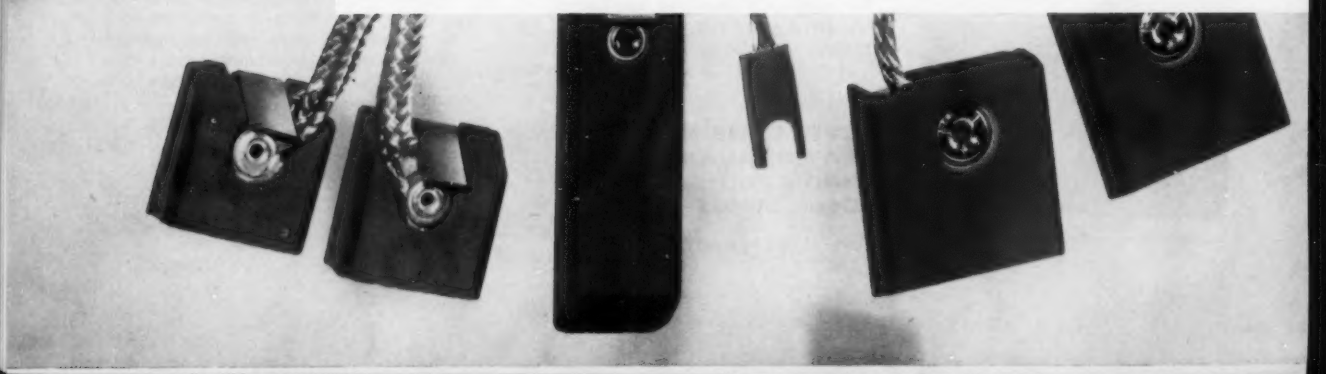
For more facts circle 638 on Reply Card——→

Now you can get a carbon brush made by General Electric for any integral-hp G-E motor or generator

General Electric now makes a complete line of carbon brushes for any G-E motor or generator over one horsepower. This means that regardless of the model or age of your General Electric rotating equipment you can get the right brush for it—a G-E carbon brush. The right G-E brush will give you top performance, long life and better commutation. G-E brushes are manufactured and tested under the same rigid standards as the equipment to which they are applied. For more information contact your nearest General Electric Apparatus Sales Office or G-E Distributor, or write Section 774-1 for bulletin GEA-5597. General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



THERE'S $5,949.81 WORTH of READING

IN THIS STORY CYCLOTHERM WROTE!

Too high—said the Zion Cooperative Mercantile Institute, Salt Lake City, of its 1953-1954 heating costs. ZCMI is the largest wholesale distributor in the intermountain area.

So ZCMI installed two Cyclotherm Steam Generators (150 and 250 hp). And from October, 1954 to June, 1955, even in a colder winter and with additions to the ZCMI plant, Cyclotherm saved ZCMI $5,949.81.

For full information on how ZCMI saved money with Cyclotherm—together with a month-by-month before-and-after table of ZCMI's heating costs—write to Cyclotherm today. You'll join the thousands of satisfied Cyclotherm users who report *more heat with less fuel.*

In Cyclotherm Cyclonic Combustion, air combines with fuel to form a vortex of flame, revolving at 200 miles per hour, providing maximum heat transfer. Cyclotherm is a complete package steam or hot water generator, 5 connections make it ready to work. From 18 to 500 hp, 15 to 200 psi. Meets all state requirements, A.S.M.E. and National Board Standards, is approved by Underwriters Laboratories, Inc. Write for complete booklet on Cyclotherm Cyclonic Combustion today.

YEARS AHEAD IN STEAM GENERATION CYCLOTHERM

CYCLOTHERM DIVISION
NATIONAL-U.S. RADIATOR CORP.
Dept. 3139, Oswego, N.Y.

For more facts circle 639 on Reply Card

cated a current flow through the signal leads, when no welding was in progress. However, the fixture motor was running. It was found that the welding ground signal lead, which originally had been connected to the power cables, had been moved to the frame of the fixture motor. The windings of the motor had developed a high-resistance short circuit to ground, which caused part of the fixture motor current to flow to the voltage controls.

Do not worry about the electron tubes. They are durable, have a long life, and are here to stay. They are presently the cheapest and best way to do the job. More and more equipment manufacturers are employing electron tubes to control such items as lathes, milling machines, and coil winding machines. An excellent book on electron tubes is published for the Army by the Federal Government. It can be obtained for $1.60 by writing to the Superintendent of Documents at Washington, D. C., and ordering "Basic Theory and Applications of Electron Tubes," Technical Manual No. TM 11-662.

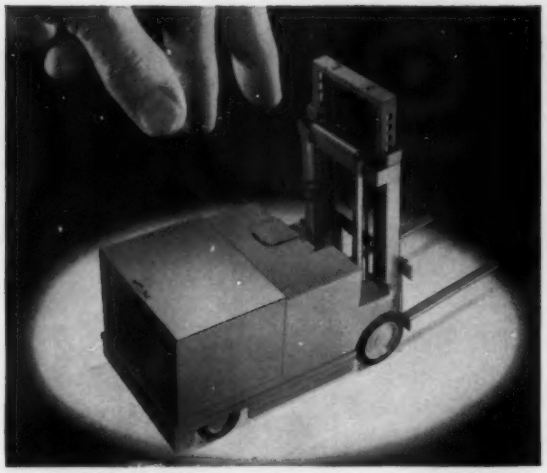
Before attempting to shoot trouble on equipment, a thorough knowledge of the control circuits is essential. The information can best be acquired by a study of the schematic diagram.

Use Test Instruments

Too many people try to determine what is wrong with a welding installation with their hands in their pockets and no test instruments. There is the true story of one individual who lays aside his instruments and tries to trace the trouble by the process of elimination. He starts out with a pocket full of fuses, inserts one, then turns the power on. When the fuse blows, he disconnects a wire, puts in a new fuse, and repeats the process. By the time he has found the trouble he has consumed 40 or 50 fuses. This is an example of how not to shoot trouble. He not only spends much money for fuses, but wastes time.

All troubleshooting on any electric welding equipment, such as discussed here, can be accomplished with voltmeters, Fig. 5, ammeters, and an ohmmeter. The ammeters should have 0-15 and 0.30 ampere scales. One should be available for measuring alternating currents and one for direct currents. There will probably be more use for the d-c ammeter. A small multimeter will suffice for the voltmeter and ohmmeter requirements.

In the event of erratic operation of a wire feed motor, the first step is to put an ammeter in series with the motor armature. This will provide more information faster than any other test. A check of control voltages tells



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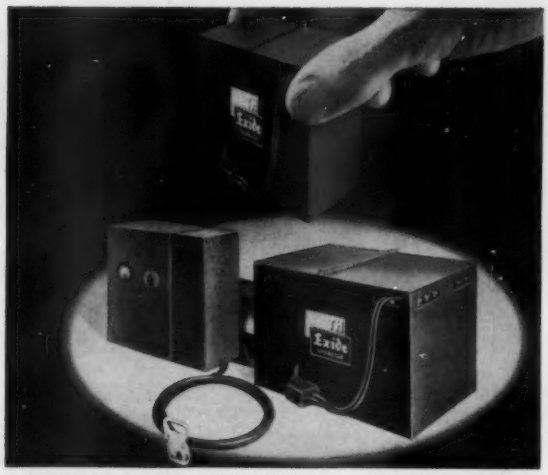

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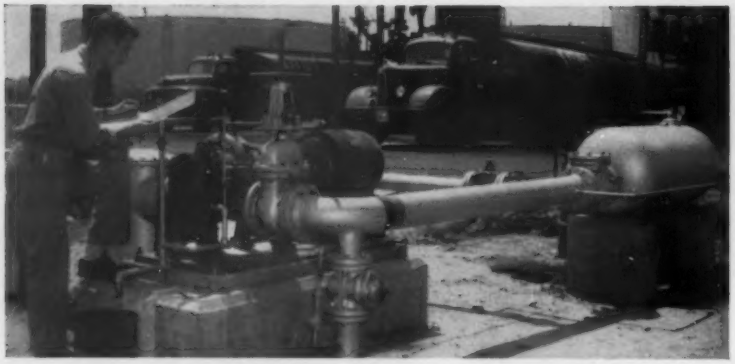

They needed pumping capacity

They needed pumping pressure

You can have capacity . . . or pressure . . . or both

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For volume pumping—33 sizes of the Fig. 3405 single-stage, double-suction pump provide capacities up to 6400 GPM, heads up to 425 ft.

For great pressure—5 sizes of the Fig. 3305 two-stage pump provide heads up to 1000 ft., capacities to 1200 GPM.

All these *extra* features are *standard* on both groups:

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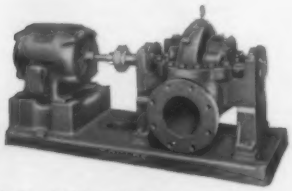
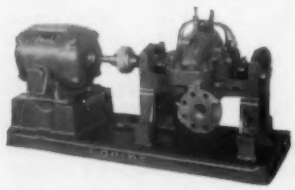
6. Stainless steel impeller rings.
7. Teflon water seal rings.

Because so many parts on these pumps are interchangeable—you can cut parts inventory in two or better.

For further information write for Bulletin 721.6 on the Fig. 3405; Bulletin 722.6 on the Fig. 3305.



Goulds Fig. 3405 single-stage pump.



Goulds Fig. 3305 two-stage pump.

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another part of the story. In cases where fuses blow, continuity checks are in order. The ohmmeter is very helpful in such cases, but it should be only used when the equipment is disconnected from the power supply.

There are certain sources of trouble that are the fault of no particular part of the equipment or installation but do occur in normal operation. Signal leads for the control are connected to the contact device such as nozzles, jaws, or guide tubes and to the grounded work piece. In machine shops, falling objects such as weldments, tools, and heavy plates, frequently break signal leads. The control cannot then properly operate.

When operating eight hours or more, contact jaws or nozzles sometimes develop contact surfaces that are

highly resistant. When the magnitude of the current flowing through these contact devices is in the order of hundreds of amperes, such contact resistance is responsible for large fluctuating voltages.

High motor currents indicate either of two things: a defective motor or excessive external mechanical load. One sometimes finds that a guide tube has become clogged, contact jaws become too tight, a conduit has kinks in it, or some other mechanical load has been placed on the motor.

Erratic travel can be a source of considerable trouble. It can cause the weld to become alternately wide and narrow. Look for trouble in the positioner, fixture or carriage drive units. Backlash in gears of drive units on positioners can produce erratic travel.

Relays in welding controls are as durable as relays in any other kind of control. In the majority of cases, they are conservatively rated, having been selected because their characteristics provide a good safety factor. Certain troubles usually associated with relays can be expected in welding installations. Their coils can open up and burn out; contacts may become corroded, oxidized, pitted or in other ways fail to make good contact. All of these things must be guarded against. The trouble shooter must be alert to all of this. In many cases these relays are operating in d-c circuits. As is known,

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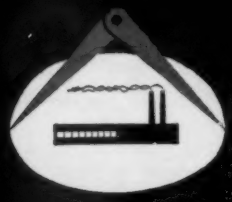

in Industry

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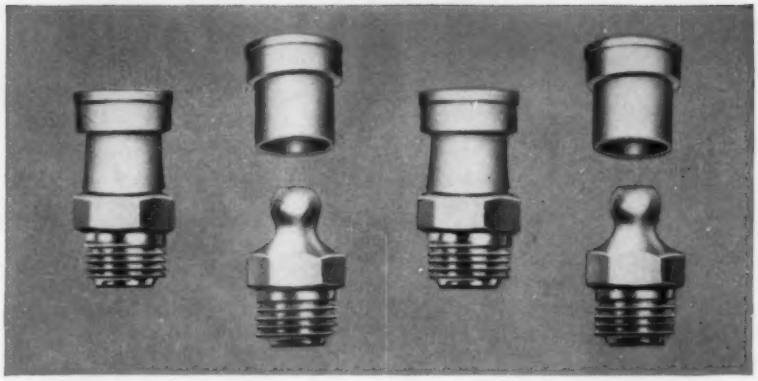

NEOPRENE grease caps eliminate a main source of bearing failure

Protect fittings from dirt

A midwestern manufacturer of lubricating caps has reported the development of snap-on caps made of neoprene, which are said to eliminate one of the main sources of bearing failure—the introduction of dirt into bearings at the time of greasing. Dirt ordinarily accumulates on the fittings and is forced into the bearing when it is greased. Capped fittings are protected from such dirt pickup, so there is no problem.

Neoprene chosen over natural rubber, plastics, paper

During the development of the snap-on cap, natural rubber was ruled out because it swelled and stuck to the fitting when exposed to grease. The various plastic caps tested became slippery and fell off the fitting. Paper did not have the elasticity needed. Neoprene finally was chosen because it has the elasticity and resilience needed for the cap to stay on the fitting plus the resistance to grease to keep it from swelling and sticking.

Color-coded fittings

Neoprene caps also come in a range of colors, which can be used to set up a lubrication schedule, to indicate the type of lubricant needed and to locate inaccessible fittings.

Other properties and products of neoprene

Lubricating caps are just one example of how the properties of neoprene can be used in plant maintenance. In addition to its resistance to oil, neoprene also resists chemicals, heat, abrasion, weather and sunlight. It is the balanced combination of these properties that makes neoprene well suited for use in gaskets, hose, belts, coatings and many other products. For more information on how neoprene reduces maintenance and replacement costs, use the coupon below.

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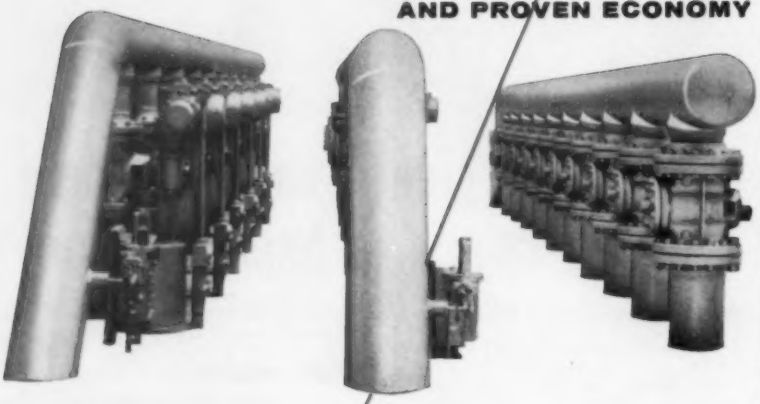

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contacts in d-c operation under inductive loads are more subject to burning than they are in a-c circuits.

Control cable failures are another possible source of trouble. Properly installed with suitable mechanical strain relief devices and hung from supporting racks, they are normally long-lived. In certain installations, where they are subject to frequent flexing, an invisible internal rupture may occur. Such a break usually results in an internal or "swinging open." These faults are difficult to find and require a painstaking search with a continuity tester.

One source of trouble — probably responsible for more downtime than any other—is defective meters. Meters are delicate instruments, which have jeweled bearings. They should be treated in the same manner as any good watch. All too frequently, however, they are subject to vibration and mechanical shock. Unless they are specially shielded, they are adversely affected by elevated temperatures and magnetic fields. Meters which go off calibration frequently cause the operator to change the control adjustments in an effort to bring the meter to the point where the book says it should be —little knowing that he is actually moving away from the desired value. Therefore, the trouble shooter should check the meters against a known standard.

Industrial Pushbuttons

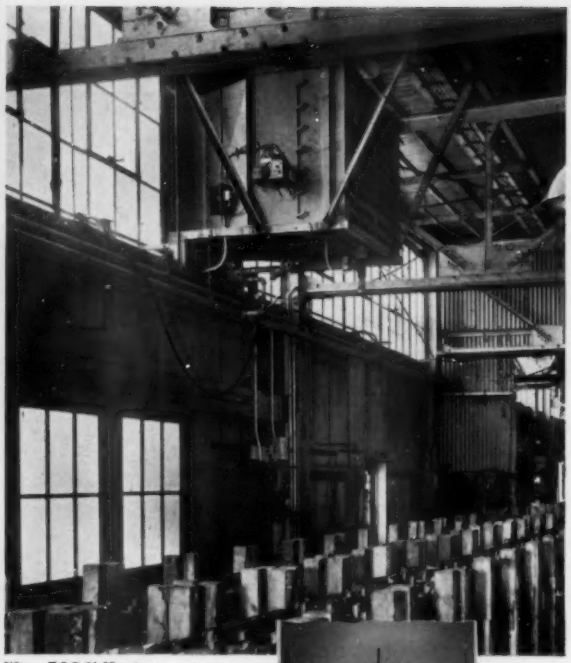
(Continued from page 117)

unlatched, with possible serious consequences. A modification of this scheme makes use of a selector switch in the holding circuit, Fig. 16. The same objections would, of course, apply to this scheme also.

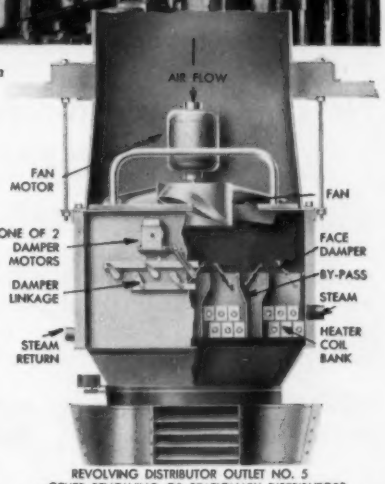
Many operators prefer the use of a separate "inch" button, with the addition of a double-pole control relay to the starter to provide foolproof inching under all conditions, Fig. 17. Although this introduces an additional device in the scheme, the control relay can sometimes also be made to perform a second function. A good example of this is the two speed starter, Fig. 18, where the control relay may also serve as a "compelling" relay, to insure that the motor will always be started at slow speed.

Although only a few of the simpler and more common applications for pushbuttons have been described, they are basic to many applications. It will be apparent that it is possible to have an almost endless variety of combinations of such pushbutton elements present in the multitude of control schemes used throughout present day industry. This again serves to emphasize the increasingly important place occupied by this relatively simple device which has become such a vital accessory in the electrical control industry.

Wing FAS-HCR Heater in factory making asbestos products



Wing FAS-U Heaters in battery-charging room



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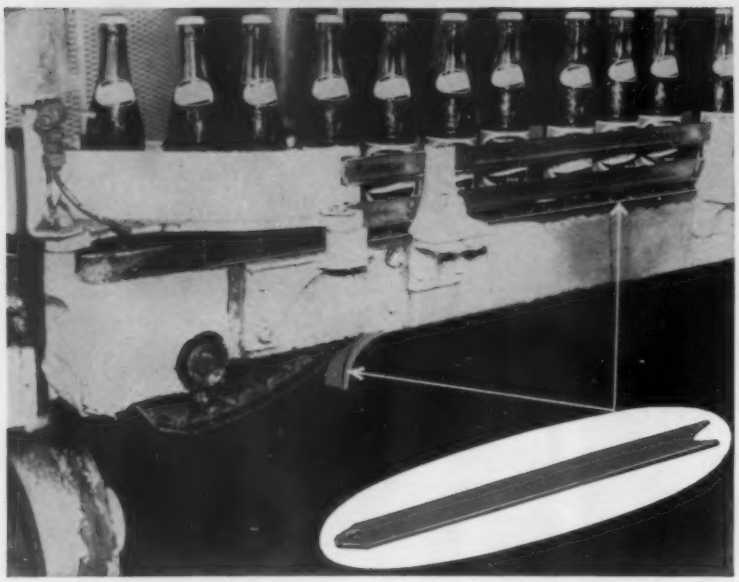

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NEW BOOKS
for the plant engineer

Production

PRINCIPLES OF MASS AND FLOW PRODUCTION by Frank G. Woollard, M.B.E. Size 9¾ by 6¼ in.; illustrated; 195 pp including index; cloth bound; 1955 edition. Published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price $7.50.

AUTHOR OF THIS book has had about 30 years experience in production engineering. He pioneered techniques at the British Morris Motor Works in the 1920's and has been associated closely with their rapid development.

Manufacturing practices associated with the automotive industry get considerable attention in this publication. A series of 18 basic principles are presented in the book; these relate to the setting up of a flow production plant. Flow production is frequently thought suitable only for large and highly organized operations. However, the author stresses that the methods described are suitable for the manufacture of articles that are readily and continuously salable.

The expression "mass production" is reportedly of American origin and might be considered by some to mean flow production. Typical examples of flow production are the assembly line operations in automotive plants. Whereas, mass production can be achieved by individual machines which are not integrated into a definite flow pattern.

Some of the chapters in the book are as follows: range of applications, time planning, accuracy of workmanship, maintenance, transfer machines and automation, cost keeping and human relations. The book deals with some of the practical problems arising from automation. Illustrations have been gathered from the United States, Britain and Europe.

Pumps

Standards of the Hydraulic Institute. Size 11½ by 9¾ in.; approx. 191 pp; illustrated; loose-leaf binding. Published by Hydraulic Institute, 122 East 42nd St., New York 17, N. Y. Price $4.75. (U.S.A.)

PLANT ENGINEERS should find this tenth edition of the publication handy to have. It contains a good deal of information encompassing various classes of pumps, terminology, application and rating standards, and instructions for installation, operation, and maintenance.

Material on centrifugal pumps in-

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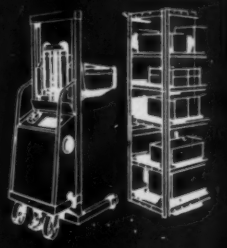

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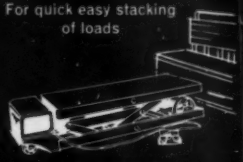

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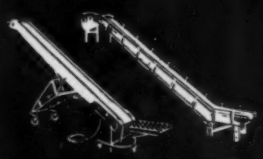

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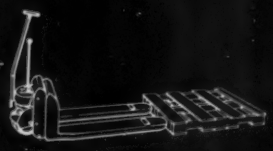

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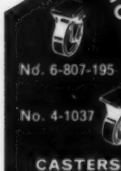

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cludes drawings of various classes of equipment in this general group. These are detailed by means of numbered arrows. The numbers are used as a cross reference in a "master" table that contains names and definitions of respective parts.

The section on rotary pumps includes a classification breakdown by types such as gear, lobe, screw, vane and shuttle block. Under the notebook division of reciprocating pumps two general classes are covered, namely steam and power pumps.

A separate data section offers a collection of tables pertaining to such items as friction losses per 100 ft of pipe, pipe dimensions, equivalent pipe lengths for different valves and fittings, properties of iron and steel pipe, and viscosities of various materials.

Slab Lifting in Construction

LIFT SLAB ENGINEERING Manual. Size 11½ by 8¾ in.; 80 pp approx.; illustrated; paper bound (looseleaf sheets). Published by United States Lift Slab Corporation, 306 Perry-Brooks Building, Austin, Texas. Price $5.00.

THE YOUTZ-SLICK method of building slab construction has been growing in use to the extent that in 1955 over five million square feet of concrete slab were handled by this system. The method derives its name from the two originators of the idea which was developed by the Institute of Inventive Research in San Antonio, Texas.

This manual presents a sample of the type of structural engineering involved in the use of this system. It also briefly presents information on the lifting equipment, including an illustration of the lifting head.

Among the specific topics covered in this publication are the following: framing for lifting, flat slab design, lifting collar selection, column connector design, column anchorage and foundation design.

Flat slab design material that is presented involves design criteria, arrangement of reinforcing, diagonal tension stresses, and an example of simplified analysis. Attention has also been given in the manual to the mechanics of making a column check for the subsequent lifts as well as those pertaining to column anchorage.

Consideration has also been given to advanced analysis in a separate portion of the manual. This touches upon the effect of earthquakes and lateral forces such as those that might be experienced from high winds.

Personal Communications

EFFECTIVE COMMUNICATION on the Job. Size 9¼ by 6¼ in.; 294 pp; cloth bound. Published by American Management Association, 330 West 42nd St., New York 36, N. Y. Price $5.50 non-members.

COMMUNICATION IN INDUSTRY, commercial endeavors and, for that matter, in every day life is a subject worth closer attention. The improper transmission of messages by word of mouth or in writing can and does result in much misunderstanding.

This handbook offers information that should be helpful in the improvement of personal communication. Twenty-two authors representing various American manufacturers, some widely known, have contributed to this book. One of the items given attention in this work pertains to something which on the surface may appear to be quite simple. It is the skill of listening. However, one of the barriers to this type of reception of messages is to "listen" without hearing. This is given attention in the book. Another barrier is that of bias or a sort of prejudice about the speaker's physical characteristics or voice quality, for example. Bias in communication is also given consideration in this work.

A portion of other topics covered by this instructive handbook on com-

Greater Magnetic Attraction . . .
More Efficient Design

Delpark Gravity Type High Capacity Low Velocity Flow
Magnetic Separator

A new, more efficient design with gravity flow over an enormous, fully concentrated flat magnetic field to give the greatest, most efficient separation of ferrous sludge and abrasives from liquid.

- Greatest concentration of Alnico #5 Permanent Magnets.
- Most powerful magnetic field.
- Magnetic field doubled in width.
- Liquids flow on top of magnetic field – gravity assists magnets.
- Low velocity flow eliminates "washing" and turbidity.
- Depth of liquid held within magnetic field.
- Constant sludge removal by chain driven flights.
- Self Cleaning – Fully Automatic.

Delpark Magnetic Separators are available with adjustable legs, with dragout in tank, with collector tank or without tank. They are also used in combination with the famous Delpark Disposable media filter.

Delpark . . . first in filtration advancements

Write for more complete information

INDUSTRIAL FILTRATION COMPANY 110 Industrial Avenue LEBANON, INDIANA

For more facts circle 647 on Reply Card

When the pressure is on

As a final step in the manufacture of Powell Valves, every valve is subjected to an *actual line test*—a *positive method* of testing. For special services, valves can be given hydrostatic, air and gas tests so that they will meet various fluid control services.

Thus, when the pressure is on *you*—when you have a production schedule that must be met—that's when you'll be glad you installed Powell Valves.

No matter what your flow control problem may be, Powell has valves designed to solve your problem. And you can *depend* on long, trouble-free service. Through careful quality control, *every* Powell Valve has PERFORMANCE VERIFIED.

Because of Powell's painstaking quality control, plant shutdown through valve failure is greatly reduced. Records from refineries, power and industrial plants the world over prove it.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our *complete quality line* which has *Performance Verified.*

The Wm. Powell Company
Cincinnati 22, Ohio
. . . 110th YEAR

PERFORMANCE
PV
VERIFIED

Bronze, Iron, Steel and Corrosion-Resistant Valves

FIG. 3061-WE—300-Pound Steel Swing Check Valve

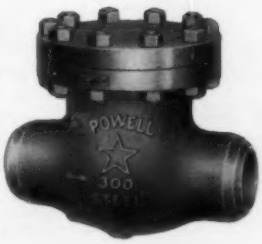

FIG. 19003—900-Pound Steel Pressure Seal Gate Valve

FIG. 1314-A—1500-Pound Integral Bonnet Steel "Y" Valve

POWELL VALVES

For more facts circle 648 on Reply Card

SCOTT PAPER PRODUCTS KEEP ROLLING ON

Imperial *Live Roller* Belting

More than 1,000,000 cartons a month are transported on the modern conveyor system at this Scott Paper Co. plant. Among the 21 Imperial job-designed belts in use are 13 Imperial Rexall Live Roller Belts. Some of these have been in service for over 10 years.

Belting job-designed for live roller service

- Constructed of heavy-duty hard silver duck and double-stitched with INNERLOCKED* stitches which prevent ply separation.
- Special impregnation produces high tractiveness and flexibility.
- Adapts to flexing between carrying and pressure rollers of conveyor. Does not consume unnecessary horsepower.
- Resistant to oil, moisture, gases and fumes.

Write for Catalog 54-3 which describes Imperial Rexall Live Roller Belting and other Imperial Belts for all types of conveying and elevating service.

*INNERLOCKED—Reg. trade-mark of Imperial Belting Co.

Imperial INNERLOCKED BELTING

First in stitched canvas belting for over 45 years

You expect more from Imperial . . . and you get more!

Imperial Belting Company

1759 S. Kilbourn Avenue
Chicago 23, Illinois

For *new* conveyors and elevators, always specify and insist on Imperial for lowest ultimate belt cost.

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munication is as follows: the handling of and introduction of a new employee, the way to instruct others, fundamentals of order-giving, reprimanding, stimulation of communication from the worker upward to a supervisor, talking over a grievance, guides to employment interviewing, effective conference leadership, and managing of a speech.

Drawing and Geometry

ENGINEERING DRAWING AND GEOMETRY—R. P. Hoelscher and C. H. Springer. Size 11¾ by 8½ in.; 510 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $8.00.

ONE OF THE OBJECTIVES of this book is to develop engineers. The teaching of clear thinking has a priority over instructing in drafting skills. Nevertheless, the book stresses principles while paying attention to good drafting procedures and is sufficiently comprehensive for use in advanced professional training courses.

The following items are a portion of the contents: sketching; sectional views; drawings for interchangeable assembly; intersections and developments; perspectives; charts and diagrams; map, pipe, tool, welding and patent office drawings. Workbooks are available for use with this book; these pertain to both drawing and geometry.

In the appendix, information is included on such items as drill and pipe sizes, roller bearings, keys, electrical symbols, standard bend radii, structural steel connections, and conversion factors.

How to Control Costs

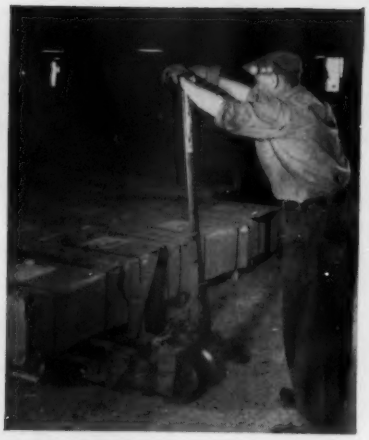
HOW FOREMEN CAN CONTROL COSTS by Phil Carroll. Size 5 by 7¼ in.; 293 pp; illustrated; cloth bound; soft cover. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price $4.00.

SINCE THE MATERIAL in this book applies to all people concerned with costs—and not only the foreman—a better title would have been "How to Control Costs."

The short chapters present the material in quick, easy doses and illustrate how cost control problems are handled at the supervisory level. The factors which influence cost control, such as, training, salvage, tools, material, maintenance, timestudies, budgets, overhead, etc., are just a few of the many subjects discussed.

Plant engineers will find Chapter 13, covering maintenance, very interesting. This chapter lists a number of points on how you can reduce costs by keeping close tab on the what, when, how and why of machine maintenance.

Model J-R with box top skid. Short turning radius for maneuverability. 2500 to 4000 lb. capacities. Bulletin 555-1.



Model TPZ low fork single-stroke handling tin plate loads. Bulletin 556-3.

Model HT. A single-stroke combination lift and platform floor truck. Bulletin 556-2.

Engineered to the job...that's Barrett!

PROBLEM: How to move the product efficiently and at the lowest cost.

ANSWER: Select handling equipment designed and built to do the job.

Three good examples of single-stroke lift trucks handling machined parts, tall skids of lumber, heavy tin plate. They call for entirely different Barrett design and type of construction. This check-chart may be of help to you in the selection of the correct equipment to handle *your* product:

- ★ Type of equipment available
- ★ Loads vs. capacity
- ★ Speeds vs. distance traveled
- ★ Safety features
- ★ Over-all length
- ★ Over-all width
- ★ Wheel size and truck height
- ★ Aisle clearance
- ★ Rugged construction
- ★ Ease of maintenance

Proved Handling Methods and Profitable Ideas

We shall gladly send you Methods and Ideas, a picture-story of how Barrett handling equipment works for industry. Forty-nine examples of correct design and construction applied to as many handling operations... ingenious applications of attachments... how Barrett can solve your problem—efficiently and economically.

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Gentlemen: Please send me Bulletin 552, 555-1, 556-2, 556-3.

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Barrett Handling Equipment

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ONE MAN DOES MORE THAN 3 OR 4...WITH A BARRETT

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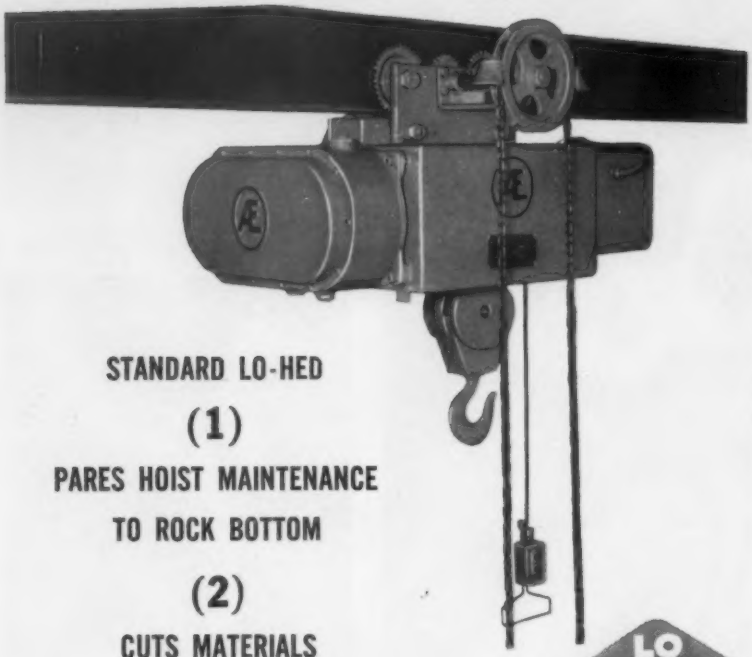
YOU'LL SAVE TWO WAYS WITH AE STANDARD LO-HED



STANDARD LO-HED

(1)

PARES HOIST MAINTENANCE TO ROCK BOTTOM

(2)

CUTS MATERIALS HANDLING COSTS

NORTH, EAST, SOUTH AND WEST, plants are enjoying new economy and efficiency with AE Standard Lo-Hed. Many users have reported *no downtime* during two full years of rugged operation. This heavy-duty machine is built to serve industry years at a stretch—and to cut materials handling costs to new lows.

Available in 2- and 3-ton models and in a choice of trolley suspension types, Standard Lo-Heds have a lower limit safety switch and a 110-volt pilot circuit for voltages of 220 volts and up at no extra cost. All-steel welded construction combines light weight and rigidity.

Immediate delivery from stock in most models... Or, if you have *special* heavy duty requirements, AE's feature-packed Customized Lo-Hed could be the perfect answer. It's engineered in capacities from ¼-ton to 12 tons, and in five suspension types... Contact your local AE representative and see how either the Standard or the Customized Lo-Hed can solve your materials handling problems.

AMERICAN ENGINEERING COMPANY

DEPT. H-164, WHEATSHEAF LANE & SEPVIVA ST., PHILADELPHIA 37, PA.

Canadian Subsidiaries: Affiliated Engineering Corporations, Ltd., Montreal, P. Q.... Bawden Industries Ltd., Toronto, Ont.

AE products are: Taylor, Perfect Spread and Vibra-Grate Stokers, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers, Marine Deck Auxiliaries.

For more facts circle 651 on Reply Card

INDUSTRIAL FILMS

Aerosols and Insects

COLOR CARTOON that tells the story of aerosols from the viewpoint of a spray-harassed insect, has won the "Golden Reel" award for best 16mm film of 1955 in the industrial processes category. "The Spray's the Thing", was one of 22 national winners in the third annual film festival of the Film Council of America.

Prints of the film may be borrowed by clubs, schools, industrial plants and other community groups at no charge except postage from Association Films' regional libraries in: Ridgefield, N. J. (Broad at Elm), La Grange, Ill. (561 Hillgrove Avenue), San Francisco, Calif. (351 Turk Street) and Dallas, Texas (1108 Jackson Street).

Plastics Molding

BRINGING together the work of artisans, craftsmen and technicians who contribute to the production of phenolic molded articles, "Molding Phenolics" presents a simple step-by-step discussion of the processes involved.

This new film can be shown on any standard 16-mm sound projector, and has a running time of 20 min. An instructor's manual containing information on various topics discussed in the film, accompanies the print. The film is available on free loan from Bakelite Company, Technical Film Library, 292 Madison Ave., 10th Floor, New York 17, N. Y.

Control Training Course

NEW SLIDEFILM instruction course designed to aid in the training of industrial personnel in the selection and application of modern electric and electronic control equipment has been made available by General Electric Company.

To be used for the indoctrination of both technical and non-technical personnel, the course is composed of eight 35-mm color slidefilms and recordings which treat common aspects of control. It also includes an instructor's manual and eight review booklets which contain the script and illustrations from the films.

The slidefilms show how control equipment operates, what types of control are available, and how to select and apply the proper control for a specific application. In addition, the course helps familiarize non-technical personnel with the theory and practice of control selection and application.

Following the two basic films, which

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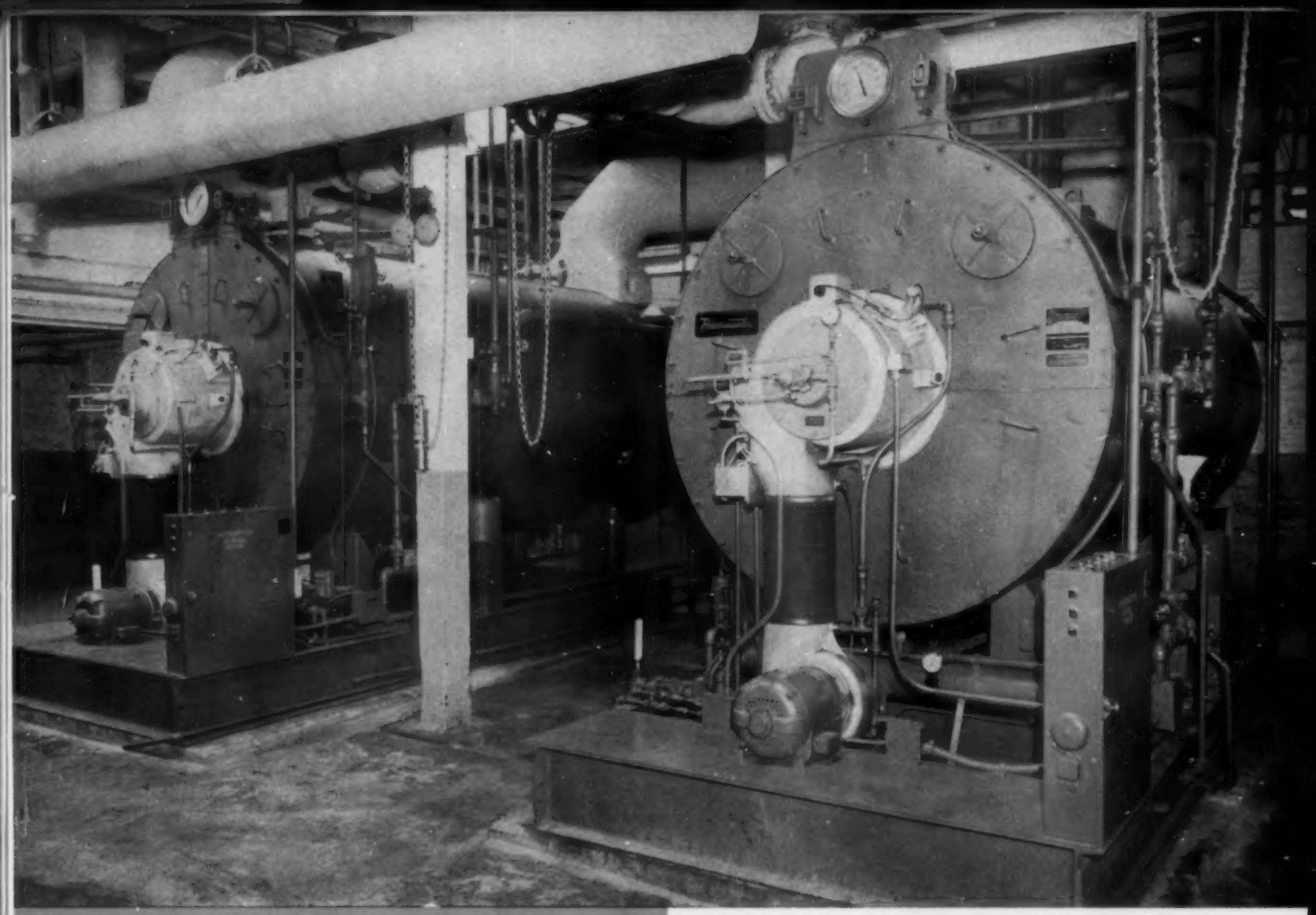
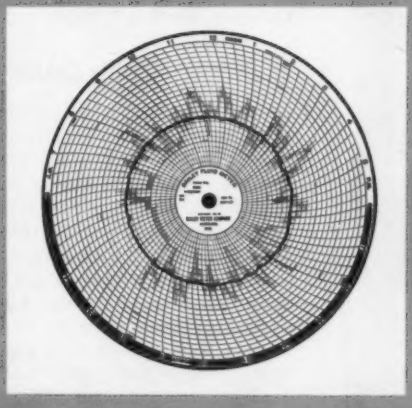


$9,040 Saving in Steam Cost

WITH *Powermaster*® PACKAGED AUTOMATIC BOILERS



This 24-hr. pressure and flow chart shows the ability of the *Powermaster* to hold constant pressure under widely varying steam flow conditions. The basic simplicity and rugged construction of the *Powermaster* modulating burner control promptly adjusts fuel firing rate to steam demand, thus, automatically holding boiler pressure constant throughout the entire steam demand range of the boiler.

These two 200 HP *Powermaster* Packaged Automatic Boilers are saving 50% of steam costs annually for a large manufacturer of clothing. In addition, they are providing hotter, drier steam for processing and comfort heating.

Completely factory assembled and fire-tested *Powermasters* have gained world-wide acceptance as dependable producers of low-cost steam or hot water. And now, you can put a *Powermaster* in your plant or building on the Pay-As-You-SAVE Purchase Plan, that helps you pay for your new boiler out of its own savings.

Write for Bulletin 1220, or ask our representative to explain why it pays to modernize with *Powermaster*.

Powermaster®

PACKAGED AUTOMATIC BOILERS

Builders of Dependable Boilers Since 1885

ORR & SEMBOWER, INC.

Morgantown Road, Reading, Pa.

establish a "common language" upon which the remainder of the program is based, the program moves into more advanced phases of control. It treats such subjects as components and accessories, control selection, control of constant speed motors, and control of adjustable speed motors. The final two films in the series are devoted to control areas closely associated with automation, such as interlocking, sequence control, and feedback control.

The program has been distributed to G-E district Apparatus Sales offices for showings to groups, including application engineers, technical specialists, machinery manufacturers, designers, consulting engineers, and student groups. The course is available on a single loan or sale basis.

Factory Planning and Layout

FOR YEARS, American industry had to do its mass producing in custom-designed and custom-built buildings. A workable mass-produced structure that could satisfy the wide range of requirements of a factory building was not generally available.

What has happened to change this picture, and what the requirements of factory planning and construction are, are subjects of a new slide film. The film stars a model, three-dimensional factory identical in every detail to its big brother, the Butler metal building. Chief value of the model is the fact that roof, side-walls and rigid frame are all removable, permitting a revealing look into step-by-step factory planning and layouts.

Material for the film has been drawn from the works of recognized authorities in the field of factory planning. Some of the subjects the film covers are estimating production capacity; determining the amount of machinery needed to produce a given output, planning raw material inventories; assessing manpower requirements; budgeting for new plant construction; providing adequate employee facilities; meeting legal requirements on docks and sidings; principal types of layout methods, etc.

Further information regarding the film may be obtained from Butler Manufacturing Co., 7400 E. 13th St., Kansas City 26, Mo.

Five-Film Booklet

FIVE NEW color and sound movies are illustrated and described in a four-page leaflet just issued. The movies include: Power Press Maintenance, Bliss' 1000th Transfer Feed Press, Transfer Feed Presses in the Appliance Industry, Bliss' High-Speed 1831 Strip Feed Press, and the Bliss-Crary Tonnage Limitor, a new device designed to protect presses from overloads at any point in the stroke.

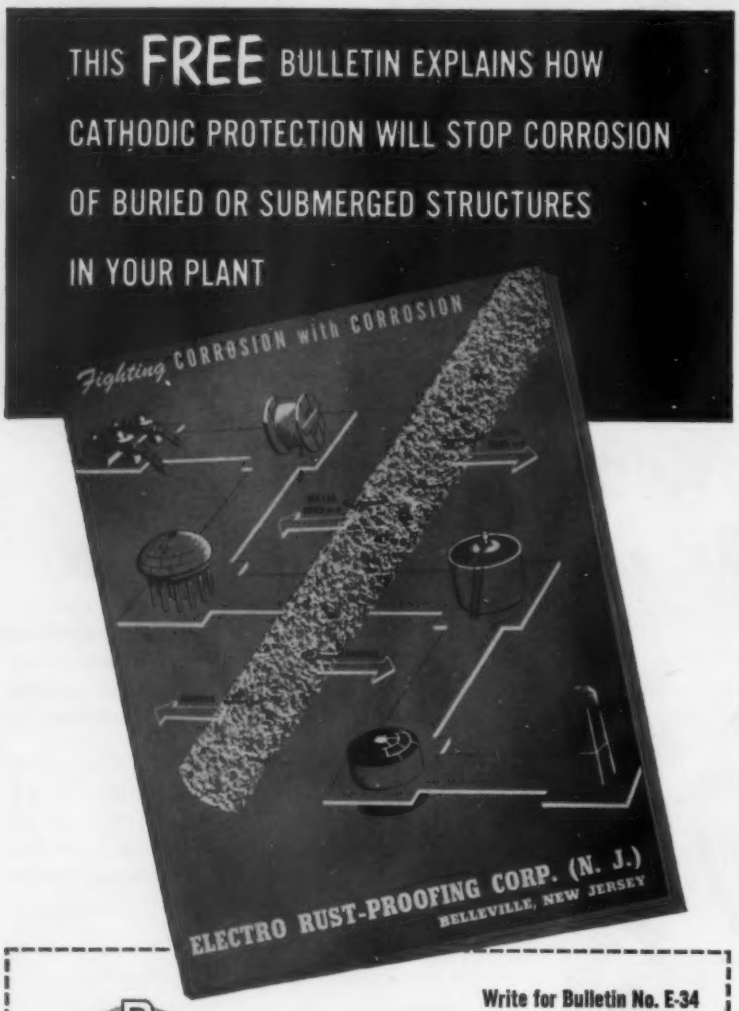
Directions for securing copies of films for showing to plant personnel are given. Copies of the movie leaflet are available by writing to E. W. Bliss Company, Canton, Ohio.

On Concrete Quality Control

INFORMATIONAL colored motion picture that shows how uniform quality concrete is being produced through improved control of water, air and rate of hardening has been announced.

The film treats with problems in meeting concrete requirements caused by variables in materials and conditions. Demonstrating the need for controlling these variables to obtain hour by hour uniformity of good concrete, it shows how Pozzolith is being employed to accomplish this result.

Entitled "The Man With The Trowel", the film runs for thirty minutes, and is available for private showing to groups of any size. Requests should be addressed to The Master Builders Co., Division of American Marietta Co., Cleveland 3, Ohio.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IN YOUR PLANT
Fighting CORROSION with CORROSION
ELECTRO RUST-PROOFING CORP. (N. J.)
BELLEVILLE, NEW JERSEY

Write for Bulletin No. E-34

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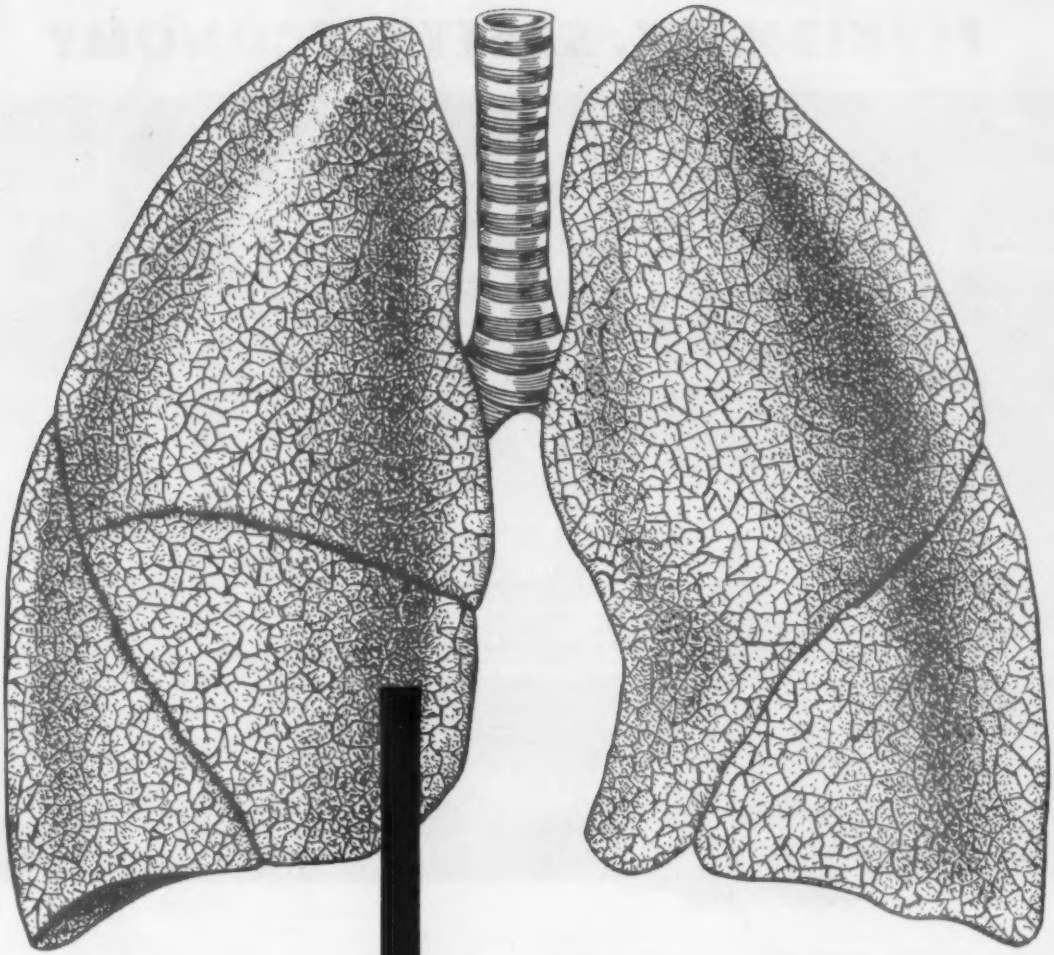

The only air handling equipment that is engineered and built better than the Clarage product.

CLARAGE FAN COMPANY
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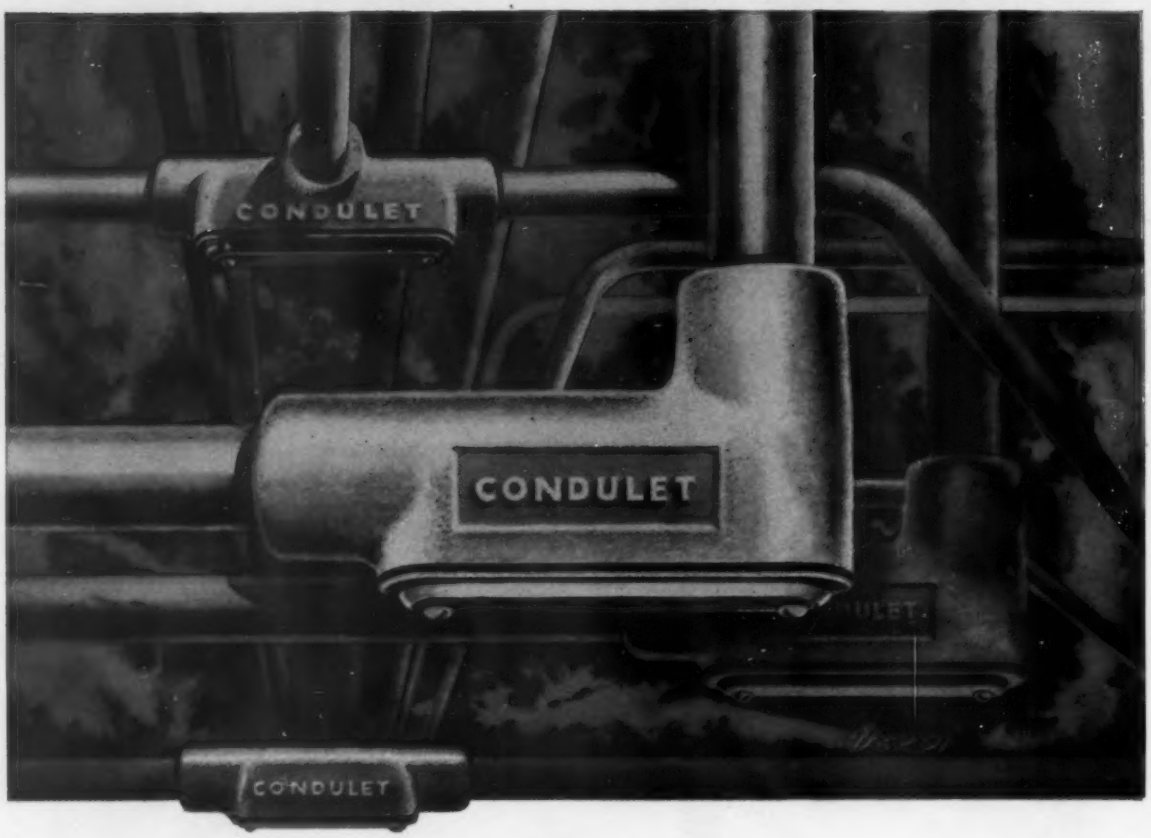
CONDULETS* and RIGID CONDUIT for FLEXIBILITY, SAFETY, ECONOMY



- **INSTALL ANYWHERE.** Crouse-Hinds Condulets and rigid conduit operate safely and efficiently under all atmospheric conditions and in all occupancies.
- **INCREASE CAPACITY EASILY.** You don't have to tear out and replace the entire system: merely pull additional wires or put in a larger size.
- **ASSURES MAXIMUM SAFETY.** Condulets are Taper-Threaded to provide a permanent low resistance path to ground.
- **GREATER DURABILITY.** Condulets and rigid conduit provide circuits with more protection against physical damage than any other wiring system. Further, Condulets are made of galvanized cast Feraloy, and resist corrosion.
- **LOWER OVER-ALL COST.** First cost is the entire cost — a minimum of maintenance is required.

COMPLETE FLEXIBILITY

There's a Condulet to meet every need of complex modern electrical layouts. See your Condulet Catalog.

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

*CONDULET is a coined word registered in the U.S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

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BULLETINS

(Begins on page 19)

158 **Safe Sling Loads**—Bulletin 5308-R lists safe loads for slings of 20 sizes wire rope when used at various angles of application. Information is listed to cover slings varying from ½ ton safe load to 48.7 tons safe load. Listings should be of assistance to power engineers faced with the problem of lifting loads with cranes, hoists. Macwhyte Co.

159 **Wire Baskets**—Bulletin WB-501 illustrates, describes and gives specifications for a line of standard wire baskets, which range in size from 18-by-10-by-3 in. to 24-by-14-by-12 in. In addition, it covers company's facilities for fast, economical design and production of special baskets and inserts to meet unusual needs. The Chas. Wm. Doepke Mfg. Co., Inc.

160 **Industrial Wheels**—Catalog HW-56 describes design and construction features of 128 different wheel combinations, including semi-steel, pressed steel and semi-pneumatic wheels. A table of wheel specifications is included. The American Pulley Co.

HEAT EXCHANGERS AND ACCESSORIES

162 **Heat Exchanger**—Bulletin 1401, 20 pp, describes an extended surface design of heat exchanger with longitudinally finned tubes known as the G-R Twin G-Fin Section. Explains in detail distinctive features of design, outlines various applications, illustrates typical installations, quotes several field service reports, and includes complete specifications and dimensions. The Griscom-Russell Co.

163 **Air-Cooled Exchangers**—Bulletin 2400, 24-pp, describes latest developments in air-cooled heat exchangers, covering design details, construction, distinctive features and applications. Also included are specifications, sketches of available arrangements, and descriptions of mechanical equipment and control apparatus for various service requirements. The Griscom-Russell Co.

164 **Controllable Pitch Fan**—Bulletin A-113 describes a controllable pitch heat exchanger fan, designed to fill the need in the process industries for a precise method of maintaining fluid outlet temperatures. Typical control diagram is included along with other data. Hartzell Propeller Fan Co.

165 **Heat Exchange Tubing**—Cited in this 30-pp catalog are typical cases where cupronickel or Monel tubing installed in heat exchangers resulted in substantial savings and better efficiency through longer tube life. Describes applications of this tubing in various instances where unusual water conditions, as to pollution, excessive turbulence, temperature and the like required metals that would withstand this rigorous wear. The International Nickel Co., Inc.

INSTRUMENTS, CONTROLS

166 **Measuring Equipment**—Eighty different devices are covered in 40-pp Measurement Equipment Catalog GEC-1016. Contains complete product information including applications, sources of additional information and pictures. Ranging from simple thickness gages to the mass spectrometer leak detector, there are instruments for research, production, laboratories and other use. Measurement categories include color, leak detection, insulation, and radiation monitoring. General Electric Co.

167 **Digital Instruments**—With illustrations, charts and characteristics of company's full line of precise automatic digital measuring instruments. Catalog 356, 28-pp, describes company's digital voltmeters, digital readouts, data reduction systems, peak reader systems, digital recording systems, a-c d-c converters and binary decimal converters. It also covers principles and applications of the digital voltmeter. Non-Linear Systems, Inc.

169 **Automation Components** — Condensed Catalog D-31, 20 pp, features automation components and control systems for improving automatic operation. Some of the products covered are differential transducer control and automation systems, a complete line of time control equipment including electronic, equipment operator mechanisms, valves, counters and electronic contactors. Automatic Temperature Control Co., Inc.

170 **Press Controls**—Form EC/2, 12 pp, shows controls specifically engineered to provide operation of presses and press accessories, automatic feed devices, scrap cutters, etc. Explains how such controls provide efficiency, flexibility and safety to presses, dies, and operators. Describes a single main control enclosure for simplified maintenance or adjustment of controls, built-in electric power and air pressure outlets, fingertip control panel, pre-testing of all control circuits, other features. Danly Machine Specialties, Inc.

171 **For Hardness Testing**—Twelve-pp Bulletin DH-328 covers functions of Tukon testers for micro and macro hardness testing of metallic and non-metallic parts, such as fine wire, precision parts, thin metal surfaces, plastics, others. Illustrations of three models, listing vertical capacities, load in grams, weight in pounds, as well as discussion of application principle included. Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.

Recent Publications on Machine Shop Aids

172 **Industrial Tools**—Catalog MC-902, 14-pp, describes company's full range of tools for wood, plastic and metal working. Illustrates variety of carbide-tipped tools now handled, and also details all sizes of the new chromium-processed "Tuff-Tooth" saw blades. Price & Rutzebeck.

173 **Improved Holding Devices**—Catalog 156, 24 pp, in addition to listing precision holding devices for production work, features references to typical problems and their solution. Emphasis is given to the application of Grip-Master vises as jig and fixture bases. Catalog covers Circle-Grip holding devices; band saw and safety drill press vises, and fixture locks; air-operated machine vises, self centering vises, air clamps and air accessories; camlock vise, screw type drill press vise, and Handnib shears, nibblers, punchers and rod cutters. Heinrich Tools, Inc.

174 **Mounted Wheels**—This 48-pp booklet offers valuable information on maximum operating speeds of mounted grinding wheels. Eight easy-to-use tables are provided to facilitate correct application. Booklet also contains rules for safe and efficient operation, and information on standard sizes of mounted wheels together with standard mandrel sizes applicable for each. There are three pages of silhouette drawings of popular standard sizes of mounted wheels. A suffix designation system, to simplify ordering mounted wheels is included. Grinding Wheel Institute.

175 **Hoods for Woodworking**—Twelve-pp Bulletin 270-E3 describes different designs of exhaust hoods for dust control in the woodworking industry. Discusses localized applications of exhaust hoods in dust collecting systems. Explains exhaust ventilation in connection with sanders, saws, wood borers, moulders and other equipment; discusses exhaust volume and transport velocity. Hood positions are diagrammed. American Air Filter Co., Inc.

176 **Machining Tubing**—Plant engineers concerned with fabrication of parts made from stainless tubular products will be interested in Bulletin TDC-182. It provides information about various machining operations on stainless pipe and tubing. Tooling, power requirements, cutting oils, and finishing are briefly discussed along with such operations as drilling, threading, reaming, others. Tubular Products Div., The Babcock & Wilcox Co.

177 **Vibration Mountings**—"Floating Rail" vibration mountings and fan and motor bases are described in Catalog FR-55. Detailed descriptions of design features are given and include the high deflection rubber-in-shear isolators, channel supports, others. Typical installations are illustrated and schematic drawings included. Industrial Div., T. R. Finn & Co., Inc.

Reader Service Cards for ordering bulletins are on the facing page. Be sure to include your name, job title, and company.

METALS

178 **Stainless Steel Sheet**—This 16-pp illustrated catalog describes the price advantage, physical properties and analysis, relative corrosion resistance, fabrication, application and care of MicroRold Type 430 nickel-free stainless steel sheet. The purpose is to acquaint stainless steel buyers and users with the advantages of this readily available material. Washington Steel Corp.

179 **Corrosion Resistant Stainless**—This designation chart, Bulletin 556-C, for corrosion resistant stainless steels identifies ACI and company designations with corresponding AISI type number, ASTM designation and with other designations and trade names of similar alloys to correlate various types for selection and reference. Also designates percentages of principal alloying elements and typical mechanical properties for 23 steels, as well as indicating application. Empire Steel Castings, Inc.

WATER, WASTE TREATING

180 **Industrial Filters**—How industrial filters can lower production costs is the theme of 10-pp Bulletin 651. Several simple case histories—from filtering city water to the filtering of recirculation water from cooling towers and spray ponds—are cited. Company's new line of IWF filters is featured, including sectional views, typical installation drawings, dimension charts and operational diagrams. Also included are sectional views of the AWF Also included are sectional views of several filters. R. P. Adams Co., Inc.

181 **Acidizing Service**—Advantages of company's acidizing service for water wells designed to increase water yield by enlarging formation channels and by removing scale deposits from pumps and screens are detailed in this informative bulletin. Case histories of successful applications are featured. Dowell Inc.

183 **Treating Plant**—Bulletin 1825, 28-pp, describes company's Accelator treating plant, covering historical development, operating features and distinguishing characteristics. Applications in water, sewage, and industrial waste problems are presented. Operating data of successful installations showing ability of Accelator plant to handle liquids of high turbidities and variable flows included. Infilco Inc.

MAINTENANCE

184 **Painting Fences?** — Now available to plant engineers is the 50-pp 1956 edition of this manufacturer's catalog on tools for economically painting fences and other surfaces. Kits for fence painting, de-rusting wire brushes, roller coaters, enamels and other products are listed. Also provided are practical suggestions for best use of these products in a wide range of painting problems. Generously illustrated with photos, catalog also includes prices, coverage. FencPainteR Div.

185 **Spray Painting** — Advantages of an electrostatic spray painting process are discussed in this 16-pp bulletin which contains diagrams of both the disk atomizer and bell-shaped atomizer. Production line examples show applications in the finishing of industrial products ranging in size from automobile chassis to door knobs. Technical laboratories where a variety of conveyors are available for testing of electrostatic spray painting are also shown. Ransburg Electro-Coating Corp.

186 **Protective Coatings**—Facts on industrial protective coatings are presented in this 8-pp illustrated bulletin. Lists advantages and applications and shows characteristic properties. An application chart details procedures for applying the various coatings. Also included are rules for getting "better mileage" from coatings. Nukem Products Corp.

187 **Asphalt Surface Seal**—Form LL-2992 describes Jennite J-16 surface seal for asphalt pavements. Lists major causes of asphalt de-

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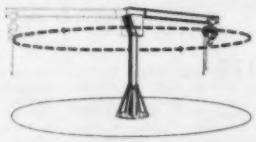

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BULLETINS

(Begins on page 19)

terioration and explains how they can be stopped. Also discusses application methods for this seal and provides cost and shipping information. Maintenance, Inc.

188 Spray Coatings — These three data sheets feature company's line of spray coatings for industrial use. Form K-2004 describes a zinc chromate metal primer; Form K-2006 gives data on a spray stencil ink; and Form K-2008, a corrosion prevention spray. Krylon, Inc.

189 Coatings, Adhesives — This company's 25th Anniversary Catalog, about 18 pp, provides technical data on properties of Magic-Vulc protective coatings and industrial adhesives. Industrial applications are also described. Includes a condensed guide to full product line in tabular form; also fuller descriptions of products. Magic Chemical Co.

190 Scale, Rust Removal—This 8-pp folder on removal of rust and lime scale by simple soaking or circulating describes the action of company's Compound No. 32, an inhibited liquid descalant, said to eliminate mechanical scraping or rodding out. Specific instructions for simple application procedures are given, as well as directions for control of solution strength. Oakite Products, Inc.

FABRICATING SERVICES

191 Tanks, Pressure Vessels—Catalog 554, 48 pp, describes and pictures facilities and workscope of this company in the custom fabrication of steel and alloy plate. Of value for reference purposes are comprehensive corrosion data tables listing corrosive action of 200 chemicals in various concentration forms on 16 different metals. Nooter Corp.

192 Sheet Metal Fabrication—Bulletin 7068, 30-pp, anticipates problems facing plant engineers looking for the unusual and complex in alloy sheet metal fabrication. Tells how special fabrication skills solved problems involving intricate shapes, close tolerances, special welding techniques, high finishes and mechanical components. Alloys described include stainless steel, aluminum, monel, inconel, nickel, titanium, multimet alloy, Hastelloy and other metal in gages up to ⅜ in. S. Blickman, Inc.

OTHER EQUIPMENT

193 For Noisy Spots—Acousti-Booths, doorless telephone booths designed to exclude outside noise and afford privacy of conversation, are described and pictured in Bulletin A-140. Several models are shown and advantages of the line are discussed. Burgess-Manning Co.

194 Colloidal Dispersions — Now available is the fifth edition of this company's list of "dag" dispersions. Some 41 colloidal and semi-colloidal dispersions for operational functions, maintenance, lubrication, machine design and other applications are included. Among these products are dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc oxide, and acetylene black. Carriers and diluents are given for each product, along with uses and physical data. Acheson Colloids Co.

195 Heating Time Calculator — Decidedly useful to plant engineers concerned with heat treating steel is this salt bath heating time calculator. It shows—at a glance—time required to heat typical steel sections in molten salt, and can be used to determine heating-up time of rounds up to 3 in. diam, to temperatures from 400 and 2400 F. Reverse side gives temperature and hardness conversion data. Ajax Electric Co.

196 Multi-Purpose Hose—Form 3680, 8-pp, describes company's "basic-five" line of multi-purpose molded hose. Includes application, construction and specification data on five types of hose, also selection chart. Thermoid Co.

197 Heating Boilers—Catalog AP-237-F, 44 pp, describes and illustrates steel boilers for heating commercial, industrial and other buildings. Presents ratings and capacities plus dimensions and engineering data. (For quick reference, brief descriptions of boiler types,

BULLETINS

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firing method and capacities are printed at top, outside corners of pages.) Among boilers pictured are those with low water lines for limited headroom installation. Also covered are indirect hot water heating coils, hot water supply and storage tanks and induced draft fans. Pacific Steel Boiler Div., National-U.S. Radiator Corp.

198 **Safety Solvent**—How to clean motors and generators quickly, efficiently, and safely with company's detergent-action safety solvent is detailed in illustrated Bulletin A-28. Applications in various industries are listed and advantages pointed out. Turco Products Inc.

199 **Indexing Units**—Catalog 106, 24 pp, contains full selection and application data on high speed indexing mechanisms available from stock. Includes methods of calculating load requirements, load ratings based on 8000 hr of operation without maintenance, and dimensions of stock and standard drives. Catalog also introduces the Trans-Pac, a standard packaged power unit for indexing straight-line assembly machines. Ferguson Machine & Tool Co., Inc.

200 **Liquid Chillers**—Form ACC-I79, 6 pp, describes and gives capacity data on more than 30 different models of packaged liquid chillers. Photos, cutaway views and drawings illustrate design, construction and applications in various industries. Airtemp Construction Corp.

201 **Air Devices**—Circular 587 describes the complete line of air devices specifically designed to eliminate costly air leaks, meet all requirements for lasting, low-cost service. Dimensions, pressure requirements and complete descriptive information on each device are included. The Lunkenheimer Co.

202 **Spray Nozzles**—Twenty-pp Catalog I, a new edition of this company's general industrial spray nozzle catalog, contains considerably expanded capacity charts and information on previous standard items and lists new ones. Fully illustrated, covers atomizing, non-clog, large capacity, gas scrubbing, flat spray, solid spray, special core nozzles and others, as well as strainers, pressure regulating valves and oil burner nozzles. Specifications and application tips included. Monarch Mfg. Works Inc.

203 **Ribbon Burners**—Eight-pp Bulletin SC-1004 describes gas-fired heating units which produce a narrow, uniform sheet or "ribbon" of flame, used in continuous heat processing applications in the glass, printing, textile, metal fabricating and other industries. Heating techniques utilized with these burners are discussed. Selas Corp. of America.

204 **Automatic Air Filter**—Bulletin 234-C describes the Auto-Airmat automatic dry-type air filter. Covers application, operation, construction and performance characteristics. Installation photos, air velocity curve, dimensional diagram, dimension and capacity chart complete the information offered in the bulletin. American Air Filter Co., Inc.

205 **Polyester Laminates**—Bulletin 100, 12-pp, describes a glass reinforced alkyd base polyester insulating material designed to meet the rigid standards of the electrical industry. Complete characteristics chart, comparison charts, and information on applications are included. Reinforced Plastics Div., Hays Mfg. Co.

206 **Oxygen, Nitrogen Plants**—Single and double rectification plants for the production of oxygen or nitrogen in gaseous or liquid form are described in this 20-pp catalog. Liquid air plants and acetylene plants are also shown and described. Production data and flow diagrams are included. Such accessory equipment as liquid pumps and drying batteries are also shown. Superior Air Products Co.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 227-228.

CONSTRUCTION

301 **Panel Wall Construction** — The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q-35-55. Includes installation photos, diagrams, specifications, as well as drawings pointing out structural details. H. H. Robertson Co.

302 **How to Glaze with Plexiglas**—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this sheet. Plastic Dept., Rohm & Haas Co.

303 **Fiberglass Reinforced Panels**—This file of bulletins covers fiberglass-reinforced panels for a wider range of industrial glazing jobs. Data is provided on shatterproof panes, Fire-Snuf panels, and metal-reinforced security panels. Strength test reports and physical data as well as information on light transmission qualities are included. Resolite Corp.

304 **Glass for Industrial Use**—How glass is used and how to choose the proper type for the application are covered in 12-pp Catalog 56-1. Discusses glass according to function; light diffusion and glare reduction; decoration; protection; and heat absorption. Photos showing various finishes and typical installations are provided, along with performance data, selection and installation tips, light transmission ratings and other data. General advantages offered by company's line of glass are also detailed. Mississippi Glass Co.

305 **Glass Blocks**—This 24-pp catalog describes company's glass block and its functions, and lists various glass block patterns manufactured, including light and solar heat controlling blocks, with details on functional advantages of each specific pattern. Included are instructions and construction details for both large and small-size panel installations in steel, wood frame, brick or brick veneer construction. Table of dimensions; a section on how to calculate illumination and brightness; and tables on solar heat control and fuel savings included. Kimble Glass Co.

306 **Steel Floor Plate**—Skid resistance and other advantages of multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, weights, data on allowable loads. Typical uses of the floor plate are pictured. United States Steel Corp.

307 **Safety Gratings**—Increased efficiency and safety are described as chief advantages of company's safety gratings featured in 16-pp Catalog BC-3. Describes various types of gratings, includes size and price data, and is illustrated with photos and drawings showing construction and typical applications. Bustin Steel Products Inc.

308 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; gives fabricating data. Alan Wood Steel Co.

309 **Steel Grating and Treads**—Bulletin 2486, 16-pp, describes types, sizes and load charac-

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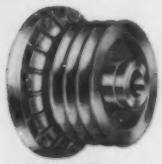

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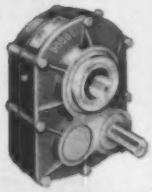

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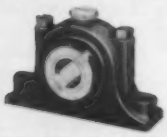

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- ☑ Torque-Arm Speed Reducers. Technical data and selection methods on all 14 sizes—1 to 60 hp. Bulletin A-637.
- ☑ Rolling Bearings. Load ratings, dimensions and other data on Dodge-Timken and SC and SCM Ball Bearings. Bulletin A-638.

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DATA FILE

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teristics of company's line of electroforged steel and interlocked aluminum grating and treads. Points out advantages in design and construction resulting in greater safety, pictures applications, and includes specifications, photos and diagrams. Blaw-Knox Co.

310 Metal Grating Handbook — Sixteen-pp Form 500 is data and specification manual covering all types of grating, open steel floor armor, stair treads, vessel liners, decking and drain grates. Contains safe load tables for basic types of gratings, panel width constant charts, tables on standard widths and types of steel treads, types of anchors used for grating. Klemp Metal Grating Corp.

311 Corrosion-Proof Materials — Bulletin CC-3, 16-pp, gives basic information on company's corrosion proof construction materials, covering chemical and physical data, estimating data and descriptions of products used for acid proof installations in the metal working, chemical, petroleum, pulp and paper and other industries. Included are sections on corrosion proof cements, tank linings, protective coatings, rigid plastic fabrications and rigid plastic pipe, plus a chart showing their resistance to chemicals. The Atlas Mineral Products Co.

312 Repairing Concrete Floors — A seven-step procedure for repairing concrete floors with non-shrink mortar is described in this folder, EPMM-4. Each step is illustrated with an actual photo and description of step involved. Strength comparisons between plain mortar and non-shrink pre-mixed mortar are given. The Master Builders Co.

313 Air Tools, Paving Breakers—These two bulletins describe company's latest models of paving breakers and air tools for plant construction and maintenance work. Bulletin PB1 gives features and specifications on heavy-duty, medium-weight and lightweight paving breakers, as well as tools for use with them. Bulletin ST-100 describes and gives specifications for clay spaders, trench diggers and backfill tampers. Gardner-Denver Co.

MAINTENANCE

314 Building Maintenance — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, roadpatching, roofing materials. Includes instruction for applying them. Flexrock Co.

315 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

316 Protective Paints — Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for wood and metal. Cellulose Products Dept., Hercules Powder Co.

317 Hot-Dip Galvanizing—How hot-dip galvanizing is prolonging life of industrial equipment is stressed in this 16-pp booklet. Photos, showing galvanized equipment in use accompany brief text explaining how this process of covering iron and steel with a protective coating of zinc serves to prevent rust. The galvanizing procedure is explained and illustrated. Coating comparison charts show how hot-dip galvanizing compares with other types of coatings as to rust resistance, dimension limits, shock resistance. American Hot-Dip Galvanizers Assn., Inc.

318 On Rust Prevention—This 1956 General Catalog, 28-pp Form 255, presents a treatise on rust prevention with illustrations of Rust-Oleum uses and applications throughout industry. Included are 102 color chips showing variety of colors available in primers, short oil type coatings, oil field finishes, restful color group finishes, machinery and implement colors, long oil type coatings, calvinoleum coatings, heat resistant coatings, chemical resistant coatings, and floor and deck coatings. Rust-Oleum Corp.

319 Insulation Coating — This 32-pp illustrated handbook, Form L-17, presents the advantages of company's NoDrip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Lists applications and describes methods of applying. Contains tabulated data on quantity required to cover various size tanks and pipe. J. W. Mortell Co.

320 For Fast Floor Repairing — This illustrated bulletin covers Kwik-Roc, a fast and tough hardening material for repairing holes and cracks in concrete floors. Tells how to prepare surfaces for Kwik-Roc, how to mix, place, and store it. Includes service recommendations. A. C. Horn Co., Inc.

321 Better Floor Care — This illustrated folder describes products designed to aid efficient floor care. Lists combination Scrubber-Vac machines, conventional scrubbing-polishing machines, steel-wool pads, applicators, vacuum cleaners, mop trucks and other mopping equipment. Included are waxes, sealers and cleansers. Finnell Systems, Inc.

322 Cleaning Problem Solutions—Illustrated Bulletin 154, 12 pp, presents information on a wide range of cleaning methods and shows equipment available. Special emphasis is placed on the stationary vacuum cleaning system and its long-run economy in many installations. The Spencer Turbine Co.

323 Brushless Suction Sweeper—Dust control features and advantages of using company's floor-type vacuum for large floor areas are presented in this illustrated bulletin. Describes operation, points out typical applications and includes dimensions and specifications. Handling Devices Co., Inc.

324 Stationary Vacuum Cleaning—Twelve-pp Bulletin A-939 describes a stationary vacuum cleaning system for industrial application. Lists advantages and describes and illustrates component parts, along with coordinated accessories and auxiliary equipment. U. S. Hoffman Machinery Corp.

325 Off-the-Ground Maintenance — Bulletin G205R, 8 pp, discusses the subject of controlling costs when maintenance goes above arm's reach. Describes trestles, swinging scaffolds, aluminum scaffolds, ladder scaffolds, step ladders, extension ladders, storage racks and other equipment designed to handle every type of overhead maintenance problem. Pictures applications. The Patent Scaffolding Co., Inc.

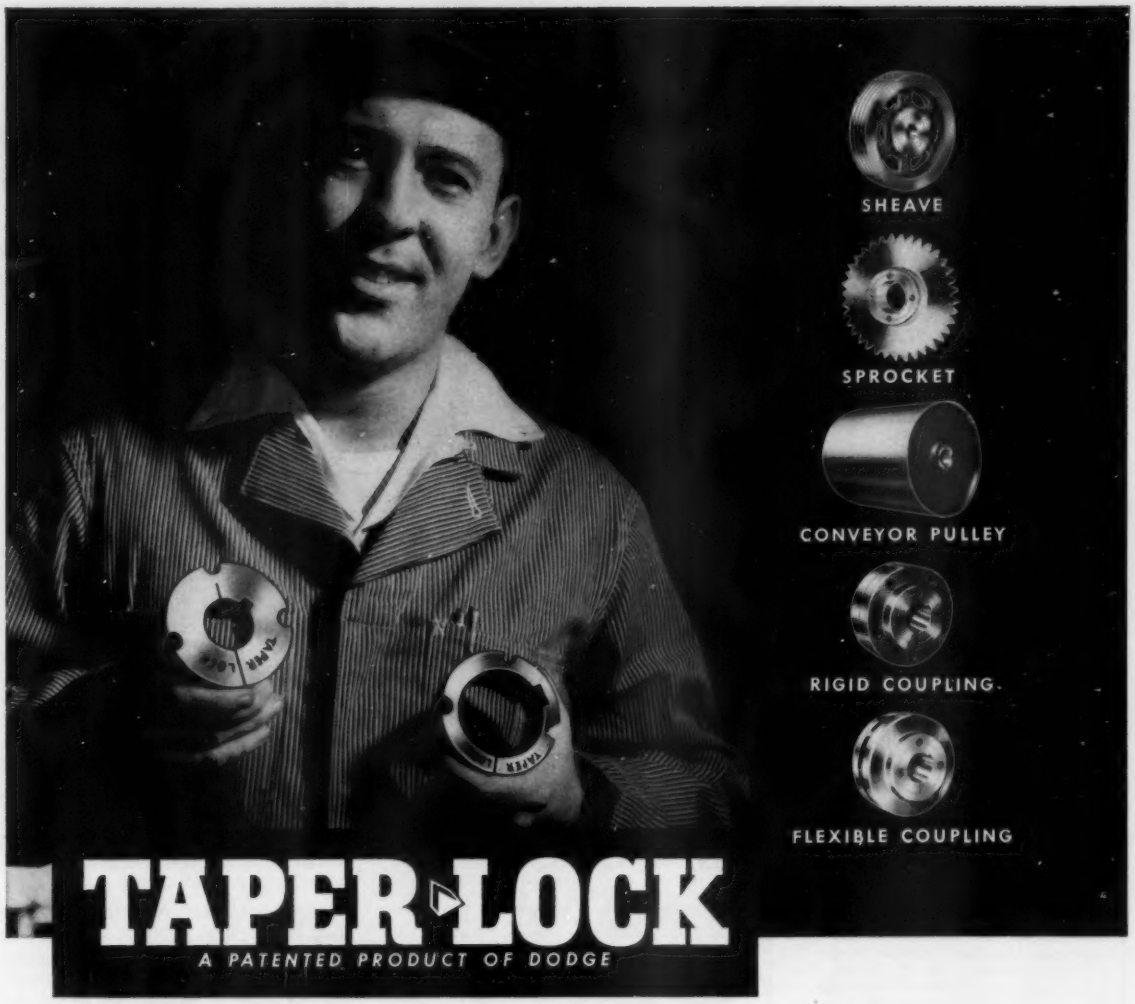
LUBRICANTS, LUBRICATION

326 Proper Lubrication — Presenting proper lubrication as the life blood of all machinery, 36-pp Lubriplate Data Book 54-1 is a helpful treatise on modern lubrication practice. Gives product data on both oil type lubricants and greases and discusses choice of lubricants for use in applications involving heavy loads, high speeds, extreme temperatures, water conditions and other conditions. Provides tables of specific recommendations for various classes of equipment used in chemical processing, metal-working, other industries. Lubriplate Div., Fiske Brothers Refining Co.

327 Centralized Lubrication — Pocket-sized 24-pp, Form 34-22, called "Ask Anyone in Industry" describes in comic-book form the hazards and inefficiency inherent in conventional lubrication practice and promotes use of centralized lubrication—in the form of Alemite Accumeter measuring fittings. Shows how these are connected by tubing to a lubrication pump which is controlled by a timer. Alemite Div., Stewart-Warner Corp.

328 "Fringe Area" Lubrication — Revised Bulletin 103A lists 17 types of molybdenum disulfide lubricants and features an explanation, with diagrams, of applications in extreme bearing pressure, and high, low and normal temperature lubrication. Five new lubricants are included. A selector chart describes each type, kind of carrier used in it, temperature range in which it operates best, and method of application. The Alpha Molykote Corp.

329 For Better Lubrication—Advantages of company's lubricants which are specially compounded for lubrication of reduction gear drives are outlined in this pocket-size folder. Features which assure smooth, trouble-free gear drive performance and lower maintenance costs are listed. Gulf Oil Corp.



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Faucet washers, when fastened with TOO LONG or SHORT screws — as in "9 out of 10" replacements by best mechanics — quickly work loose, destroy themselves!

"SEXAUER" finds the answer—after 34 years research

Now, NEW Pat'd. "Sexauer" SELF-LOCK screws, with expanding NYLON PLUG imbedded in the threads, fasten and *lock* at correct depths AUTOMATICALLY, hold faucet washer *firmly*. Made of rust and corrosion resisting Monel, heads won't twist off, screw slots won't distort; they can be used over and over.

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EASY-TITES are made of super-tough, pliable duPont compound (neither rubber nor fibre) to withstand super-hot water and make tight even on worn, corroded seats. They are further *reinforced* with a vulcanized layer of Fiberglas to resist distortion and splitting from shut-off squeeze.

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(Begins on page 231)

330 **Multi-Purpose Grease** — This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, affords protection. Socony Mobil Oil Co., Inc.

331 **Lubricants—Specification, Classification** —Vital information on selection of lubricants is presented in 10-pp Vol. 41, No. 4 of Lubrication. Covers such items as performance specifications, initial suitability of lubricants, quality of lubricant, effect of lubricant on production, effect on maintenance, effect on power, effect on cost, and features a look to the future. The Texas Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

332 **Choosing the Right Valve** — Presenting valve selection as a matter of matching the valve's service characteristics with the service requirements of the job, this practical 20-pp booklet explains and illustrates basic design features of gate, globe and check valves. It tells in non-technical language, how each of these valve types works, and where it is best suited for use. Disc, stem connection, bonnet and bonnet-joint characteristics are also discussed and stem-operation is treated. Crane Co.

333 **Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions. The Walworth Co.

334 **For Quick Valve Selection** — Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated, includes pressure-temperature chart. The Ohio Injector Co.

337 **Plug Type Valves**—Bronze plug type valves with 500 Brinell armor seat are illustrated and described in this 6-pp brochure, Form 202. Includes photos of various models, full specifications, as well as a cutaway view showing outstanding features. Jenkins Bros.

338 **Reducing Valve Engineering Data** — Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straightline flow, tight closing. A. W. Cash Co.

339 **Automatic Controls**—Technical data on company's line of automatic controls are presented in this 46-pp catalog. Includes specifications, dimensional tables, electrical ratings and capacity data on diaphragm gas valves, magnetic valves, hydramotor valves, oil burner valves, reducing valves, safety shut-off electromagnetic valves, time delay valves, and others. Photos, drawings and dimensional diagrams illustrate text. General Controls.

340 **Diaphragm Valves**—Catalog V-55, 34-pp, covers operation, installation and selection of diaphragm valves for handling of acids, alkalis, gases, volatile and viscous substances, water and other fluids, compressed air, vacuum, slurries, semi-solids, beverages and food products. Diaphragm materials are described, selection tables included, as well as dimensional drawings and specification tables. Hills-McCanna Co.

341 **Automatic Regulators**—Illustrated information on 12 basic control valve types used in chemical process industries, power generating facilities, and in liquid or gas pressure control applications requiring precise instrumentation by automatic regulators is presented in this bulletin. Reducing valves, pump governors, relief valves, temperature regulators, float valves, damper regulators, combustion control valves, and boiler feedwater regulators are among the items treated. Atlas Valve Co.

342 **Steam, Air and Gasoline Traps**—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Cov-

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Napolitan Sheet Aluminum Welding Flux. Formula 40 is unsurpassed for welding aluminum and its alloys in either sheet or cast form. *Formula 42* generally is satisfactory to use for a variety of work where reduction of welding costs is a factor. It is less expensive than formula 40.

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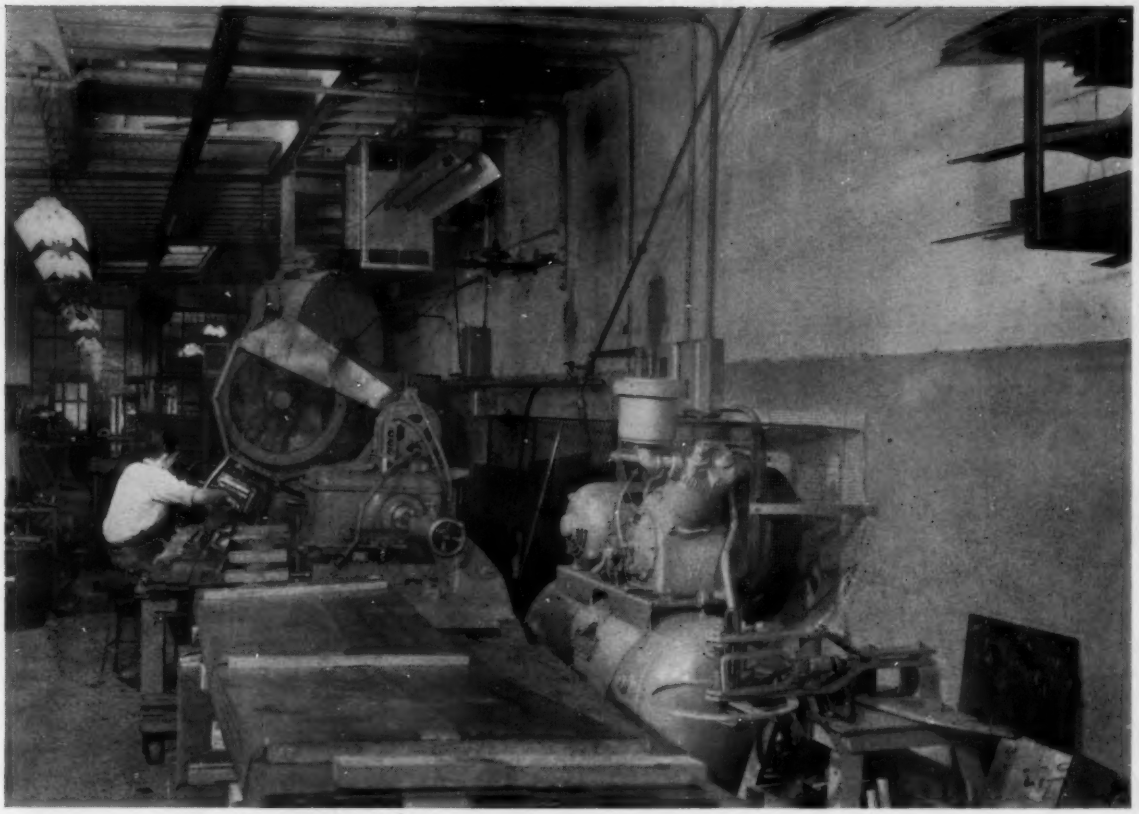

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(Begins on page 231)

ers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressure up to 1500 lb. W. H. Nicholson & Co.

343 **Steam Trap Selector**—Twelve-pp Bulletin T-9 is designed specifically to aid in the selection and application of steam traps on chemical processing equipment. Features a fold-out piping diagram for 22 pieces of typical processing equipment—each showing recommended steam trap and piping arrangements. Also contains steam trap selector tables. Yarnall-Waring Co.

344 **Steam Trap Solutions**—Bulletin F-151, titled "Solving Steam Trap Problems," is a 36-pp illustrated booklet giving specifications and capacities of steam and float traps, air release valves, pipe line strainers. Tells how to calculate condensation loads and select traps for unit heaters, jacketed kettles, submerged surfaces. Gives pointers on installing and servicing traps. Also included in this edition is information on combination flat and thermostatic traps. The V. D. Anderson Co.

Reader Service Cards for ordering catalogs are on pages 227-228. Be sure to include your name, job title, and company, even if you want catalogs mailed to your home address.

345 **Aluminum Pipe and Fititngs** — Aluminum pipe—for conveying everything from air to acid—is described in this 18-pp Form AD197. Booklet presents characteristics and advantages for each major field of application. Specifications are provided, along with a description of appropriate fittings and methods of installation. Describes process industry applications and advantages. Similar treatment is accorded other fields, including pipelines, portable piping, and structural piping. Aluminum Co. of America.

346 **PVC Pipe Fittings, Flanges**—This is a comprehensive 12-pp catalog on corrosion resistant pipe fittings and flanges in normal- and high-impact grades, rigid, unplasticized polyvinyl chloride. Shows characteristics, advantages and limitations. Lists operating pressures, temperatures, applications, price comparisons, fabrication advice, installation and supporting recommendations, dimensions and weights. Grinnell Co., Inc.

347 **Glass Pipe and Fittings**—Corrosion-resistant qualities of this Pyrex brand glass pipe and fittings which make it suitable for use under corrosive conditions are described in 18-pp Bulletin EA 3. Operating temperatures, physical characteristics, installation procedures are covered and specifications and dimensional drawings are included. Corning Glass Works.

348 **Wrought Iron Pipe**—Technical information required in specifying pipe and tubing is graphically presented in this 52-pp catalog. Tables list size and dimensional data of wrought iron pipe and tubular products, and show dimensions. Data is also provided on wire and sheet metal gages, flow of water in gpm and conversion factors. Tables include size and dimensional data for various types of pipe. Supplementary tables give information on wrought iron physical characteristics and special properties. A. M. Byers Co.

349 **Improved Hose Coupling**—A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines is described in this 16-pp bulletin. Describes the coupling's construction and explains how it provides a sealing action which makes the coupling tighter as internal pressure increases, and a full swiveling action that prevents hose twisting and kinking. Titeflex, Inc.

350 **Welding Fittings**—When and where to use company's Weldolet welding fittings is told in 38-pp Bulletin W-4. Includes tables listing sizes, dimensions, weight, and price, as well as dimensional drawings. Installation procedure

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. . . that will show you how UCON synthetic fluids and lubricants can make a difference in your equipment performance, processes, and formulations—and, more than likely, save you money? (Their uses are many and diverse, ranging from mechanical lubricants to cosmetic components to hydraulic fluids.)

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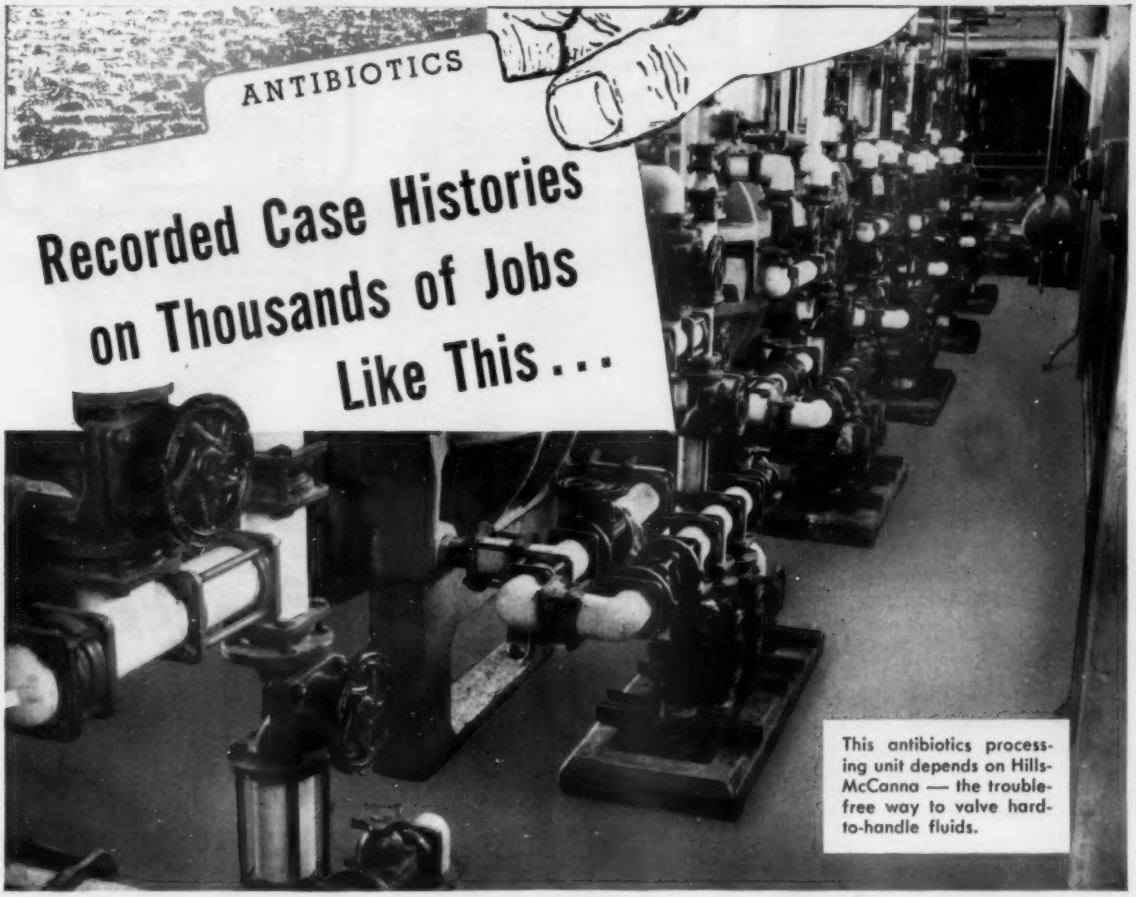
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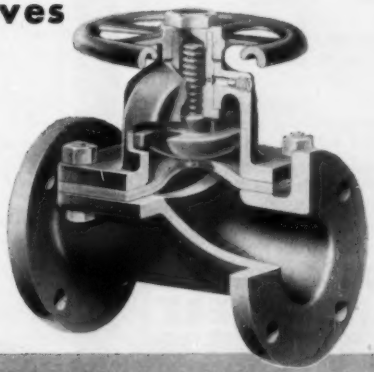

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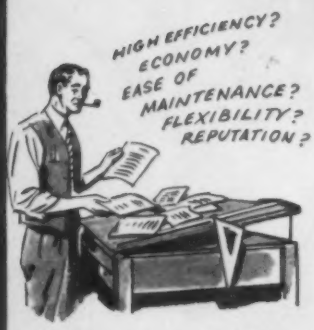

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SERVING INDUSTRY THE WORLD OVER

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(Begins on page 231)

is fully described and specifications, graphs providing reinforcing information, and photos of typical applications are also included. Bonney Forge & Tool Works.

351 **Valve Couplings**—Bulletin 551 presents engineering data on company's line of valve couplings, hose couplings and hose clamps. Includes dimensions for valve couplings, price list, and a table showing dimensions of standard hose couplings. C. B. Hunt & Son, Inc.

352 **Piping Insulation** — Seven-pp Bulletin SO 1054 features a snap on, one-piece molded pipe insulation of fine glass fibers for hot or cold piping. Specifications are given for industrial, commercial, and institutional piping where maximum efficiency is of primary importance and for hot water and low pressure steam. Gustin-Bacon Mfg. Co.

353 **Pipe Insulation**—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between —300 and 800 F. Complete listing of physical properties, condensed specifications are given. Pittsburgh Corning Corp.

WATER TREATING

354 **Water Softeners**—Cutaway drawings in Bulletin MSP-123 illustrate construction of company's water softeners, and indicate simple connections by which a softener is fitted into a water system. Capacities of the various models are given, together with other specifications. Hagan Corp.

355 **Carbon Dioxide Measurement** — Technical Paper 133, 16-pp, discusses determination of CO_2 in water by conductivity measurements. Describes a new method developed for the determination of carbon dioxide which is applicable to analysis of waterside deposits, treatment chemicals and organic carbon in water. W. H. & L. D. Betz.

356 **For Industrial Water Softening**—Greensand, zeolite and resinous exchange water softeners are described in 8-pp Form S105. Discusses features and applications of each of these basic types and illustrates some installations. Includes capacity data and general specifications. Also describes and pictures controls for water softeners, pressure filters and deionizers. Illinois Water Treatment Co.

DUST CONTROL AND AIR CONDITIONING

357 **Dust Control, Blast Cleaning**—Bulletin 1210, 24 pp, fully illustrated, describes manufacturer's line of blast cleaning and dust control equipment, accessories. It is indexed according to equipment, type and purpose. Lists three methods of application. Pangborn Corp.

358 **Dust Control** — "Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size, distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

359 **Manual of Exhaust Hood Design**—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust source. American Air Filter Co., Inc.

360 **How Conditioning Units Can Help**—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling and on hot water and steam heating. Clarage Fan Co.

361 **Dust Filter** — Design, application and benefits of company's AC dust filter are described in illustrated 26-pp Bulletin 559. Filter

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PERMITS THE USE OF MORE ABRASION-RESISTANT, RUBBER-COVERED HOSE

Insure longer wear in your hydraulic hose assemblies—and at the same time, save assembly time by avoiding old-fashioned skiving. Joy Surgepruf re-usable couplings make *both* advantages possible. Their exclusive "double-wedge" grip lets you use tough, abrasion-resistant, rubber-covered hose instead of the braided type—without any need for skiving the hose at the connection.

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CAN BE RETIGHTENED WHEN LOOSE ON THE HOSE

Machine vibration or hose flexing can loosen any hydraulic coupling on the hose in time, but Surgepruf Couplings can be easily, quickly retightened on the job to stop a leak—*another* exclusive feature.

Surgepruf Hose Couplings are made to JIC Standards. Assemblies are available in many sizes and lengths, and in both single and double-wire reinforced types for medium-high and high pressure service respectively. *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*

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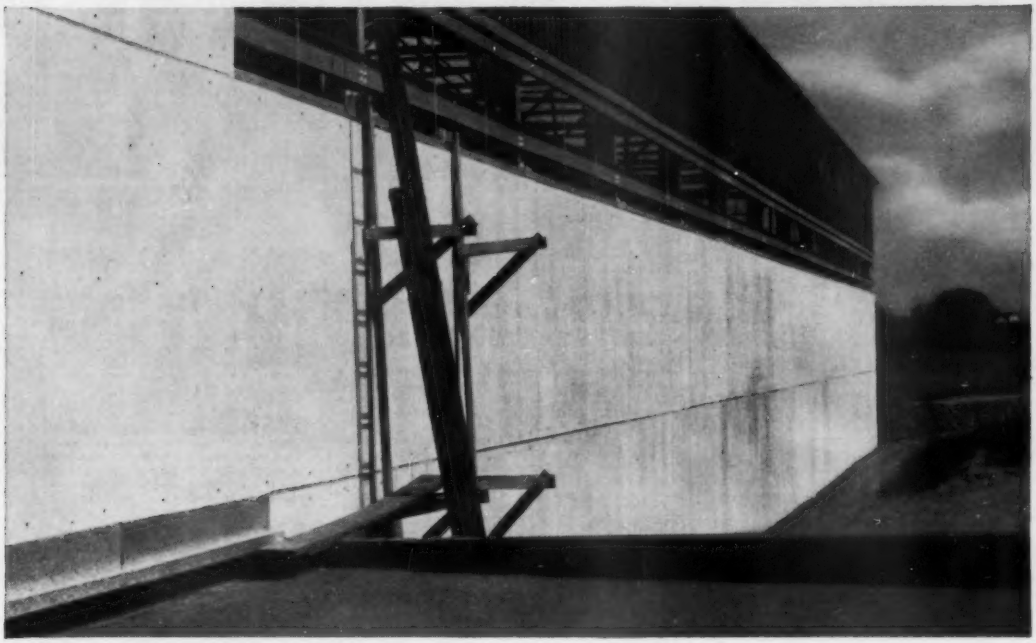
Johns-Manville TRANSITOP® Structural Panels meet the trend to modern panelized construction



Transitop Panels offer maximum coverage... minimum erection cost

THE MOST striking change in building construction methods in recent years has been the trend toward prefabricated building panels.

This is particularly true in the construction of panelized curtain walls for buildings, large and small. Although curtain wall construction in skyscrapers has been widely publicized, this method of construction is just as applicable to smaller buildings such as schools, hospitals, office buildings, motels and shopping centers. Today, paneled curtain walls probably exceed all other applications in popularity and are rapidly becoming the standard method of building construction.

Johns-Manville Transitop offers architects, designers and builders a simple and economical method of providing panelized curtain walls. Transitop is durable, weather resistant, requires minimum maintenance. As a curtain wall, Transitop provides high structural strength, reduces the dead load, increases usable floor space, provides adequate insulation and is easy to erect. Panels are easily applied over wood or steel framing.

The same advantages that make Transitop so suitable for panelized curtain wall construction also make it equally ideal for roof deck construction.

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- Core of integrally impregnated insulating board
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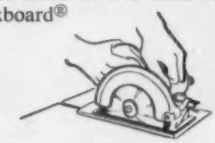

- Transitop is cut to fit and installed with ordinary construction tools

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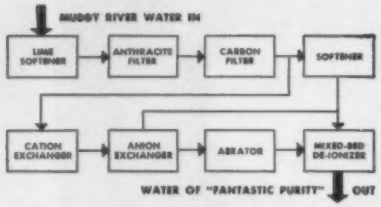

This block diagram shows a typical arrangement for a power company steam plant that must draw its boiler feed water from a nearby muddy river. The Lime Softener takes out suspended solids, turbidity, alkalinity, and organic matter; the Anthracite Filter removes any remaining turbidity; the Carbon Filter removes the chlorine; the Softener provides process water; the Cation and Anion Exchangers remove the dissolved solids such as carbonates, sulfates, and chlorides; the Aerator takes out most of the CO_2; and the Mixed-Bed De-Ionizer eliminates the remaining 4 or 5 ppm of solids, silica, and 5 ppm of CO_2 — to produce water of "fantastic purity."

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DATA FILE

(Begins on page 231)

performance curves, principle of air filtration, filter comparison charts, woven vs felted filtering media are featured, along with technical data on design, capacity ratings, dimensions, velocity, air volume and pipe friction tables. Installation photos and drawings of typical equipment layouts are included. The Day Co.

363 **Air Conditioning Filters**—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters for the removal of air-borne impurities given. Dollinger Corp.

364 **Flexible Hose**—A set of five bulletins (Nos. 40 through 44) are of interest to plant engineers concerned with the design, installation or purchase of flexible hose for dust and fume control, air conditioning and materials handling. They provide general information, data on installation, application suggestions, technical data and prices on hose, duct and accessories. The Flexaust Co.

INSTRUMENTS, CONTROLS

365 **Versatile Electronics**—How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give electronic control its flexibility and application to a wide variety of installations are described. Minneapolis-Honeywell Regulator Co.

366 **Thermostatic Shower Control** — Safety advantages of the Hydroguard thermostatic controls for showers are outlined in illustrated Bulletin 366. Design and construction details are shown, capacity, and applications in industrial plants and institutions cited. The Powers Regulator Co.

367 **Automatic Controls** — Mercury-switch equipped controls for heating, refrigeration, air conditioning and other industrial uses are presented in 52-pp Catalog 856. Fully illustrated, book provides ordering and application information on a variety of pressure controls, temperature controls, level controls, limit and fan controls, and many others. Also presents data on relays, and on tilting-type and magnet-operated mercury switches. The Mercoid Corp.

368 **Service Regulators** — Revised Bulletin 1026, 20-pp, features company's line of service regulators. Rate-of-flow graphs illustrate mathematically the determination of maximum outlet pressure build-up and amount of gas relieved to atmosphere by extra safety device in case of failure of regulator. Rockwell Mfg. Co.

MECHANICAL POWER TRANSMISSION

369 **Sprockets and Chain** — Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. Devotes a page to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Corp.

370 **Roller Chains, Sprockets**—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations, chain length calculations, dimensions and price lists for single and multiple strand roller chains. Diamond Chain Co.

371 **Power Transmission Equipment**—Form 118, 24 pp, gives descriptive and technical information on variable speed pulleys, wide V-belts, sheaves, motor bases, countershafts, and Select-O-Speed transmissions. Illustrated with photos and dimensional drawings, booklet provides ratings, sizes, application and installation tips. Lovejoy Flexible Coupling Co.

372 **Flexible Couplings** — Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

373 **Fluid Couplings**—Bulletin 144-D, 14-pp, presents complete installation and performance data on fluid couplings. Illustrated with diagrams and drawings, bulletin shows ease of applying company's fluid couplings on any type industrial equipment, powered by any type electric motor or internal combustion engine from ¼ to 850 hp. Describes standard models providing standard input, output combinations, and standard models in packaged units. Installation hook-ups are given, along with typical applications. Twin Disc Clutch Co.

374 **Adjustable V-Belt**—This 8-pp catalog covers company's Veelos TD and TE V-belt designed to reduce installation and operation costs on big drives. Studs, cup-washers and T-screws of the belt are illustrated, and installation and operation characteristics explained. Booklet includes directions on how to measure, to couple and uncouple, and to install. A table shows current lengths for these belts. Manheim Mfg. & Belting Co.

375 **Improved V-Belts**—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

376 **Shaft Mounted Drives**—Plant engineers who use machines requiring input speeds between 420 and 10 rpm in the range between ½ and 30 hp, will be interested in 8-pp Bulletin 7101. Contains complete information—design data, selection tables, dimensions, weights, installation photos—on this modern type of stand-

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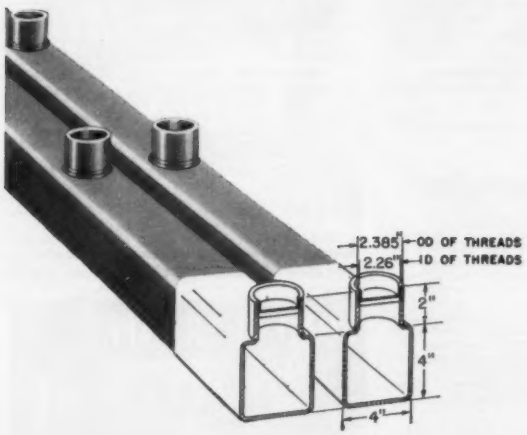

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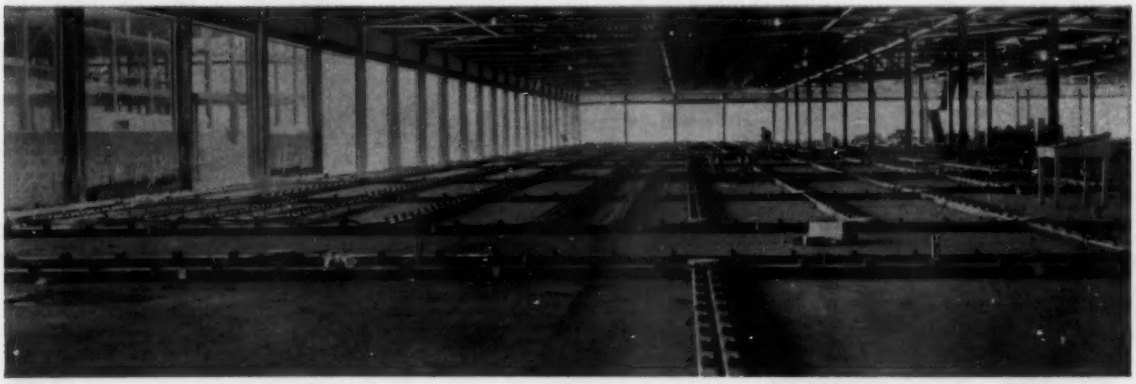

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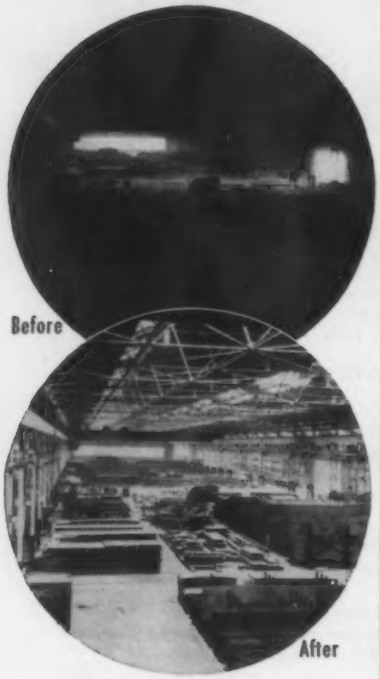

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DATA FILE

(Begins on page 231)

ard gear drive designed for high ratios of speed reduction in limited space, with savings in initial and installation costs. The Falk Corp.

FANS, VENTILATING

377 Industrial Fans—Propellair Bulletin 650, 12 pp, contains dimensions, application, and performance data on Tubeaxial and Stack-booster fans. Gives information on cooling and drying problems, system and open surface tank ventilation. Robbins & Myers, Inc.

378 Ventilating Sets — Quiet operation, rugged construction, lower costs and other advantages of Util-A-Vent sets are stressed in 30-pp Bulletin UVS 103. These sets are designed for low cost handling of applications requiring low and medium ranges of air capacities. Bulletin presents dimensional and capacity data on direct-driven units with forward curved wheels, and belt-driven units with forward curve or backward blade wheels. Performance curves are included, and some right and wrong duct installations pictured. General Blower Co.

379 On Ventilating Systems—Design and engineering data on company's line of ventilating fans and blowers are presented in 32-pp Bulletin 310. Includes table showing air change requirements of various types of rooms and areas, discusses details of fan operation and design, the use of ducts, special conditions which govern fan selection, design and operation of blowers. A section on how to design systems is included. Ilg Electric Ventilating Co.

MATERIALS HANDLING

380 Cranes for Big Jobs—A new 1½-yard shovel, 35-ton crane is described in this 6-pp catalog. Action pictures of the machine in quarries and gravel plants are included, also specifications. American Hoist & Derrick Co.

381 Electric Hoists—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb. capacities. Fully illustrates and explains design features and gives details on suspensions and conductor systems. Clearance data, specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

382 Electric Hoist Manual—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load-Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys. Manning, Maxwell & Moore, Inc.

383 Manual on Electric Hoists — Catalog H-46, 40 pp, covers monorail and stationary hoists and car pulleys. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

385 Transit Crane—Twelve-pp Bulletin 15-B-TC-1 describes a transit crane of 15-ton capacity. Illustrated by job application photos and closeups of mechanical features, the booklet includes a list of specifications and working ranges, plus brief, easy-to-read description of the machines, advantages. Bucyrus-Erie Co.

386 Floor Type Conveyors—Catalog 51, 90-pp, contains engineering data on company's line of floor type conveyors, including belt conveyors, apron conveyors, bulk handling conveyors, chassis assembly conveyors, drag conveyors, flight conveyors, foundry block conveyors, log conveyors, mould conveyors, package handling conveyors, piano hinge conveyors, and others. Also covers other conveyor equipment such as conveyor chains, inclines and declines, cross sections, switches, sprocket turns, take-ups. Catalog is profusely illustrated with photos, schematic drawings, and includes full specifications. Jervis B. Webb Co.

387 Continuous Power Conveyor — Sixteen-pp Catalog A-96 describes a packaged overhead conveyor for light duty applications. This complete basic "package" contains drive unit, take-up, oiler and other items essential for a 50-ft

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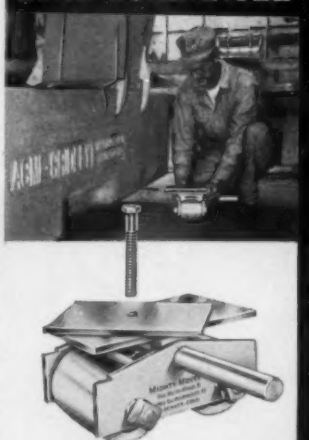

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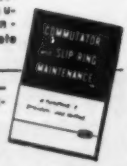

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DATA FILE

(Begins on page 231)

system. Describes power drive unit, track, power chain and other components and discusses lubrication and chain safeguards. Suggested layouts are diagrammed, and some installations of these conveyors are illustrated. Richards-Wilcox Mfg. Co.

388 Engineered Conveyor Systems—Catalog 853, 32 pp, illustrates conveyor systems in use in a wide range of industries, showing how they suit handling requirements involved. Roller, wheel, belt, chain, overhead trolley and elevating conveyors are included, also spirals, portable power conveyors, ball transfers and special equipment. Mathews Conveyer Co.

390 Conveyor and Elevator Belting Tips—This 32-pp manual on installations, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing, and fastenings are also covered, and there's a table listing common conveyor belt maintenance problems. The B. F. Goodrich Co.

391 Metal Conveyor Belts — This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

392 Conveyor Belting — Folder 54-3, contains a capsule description of construction, types of treated stitched canvas belting for all conveying and elevating applications. Describes company's general conveyor and elevator belt, oil- and acid-resisting belts to handle hot materials to 600 F. Imperial Belting Co.

393 Materials Handling Methods — Bulletin 552, 16-pp, illustrates 48 manhour and space-saving handling operations, and shows various material handling equipment at work in many industries. Shows how properly selected equipment gets more work done and reduces costs by making handling jobs easier. Describes general materials handling movements, motor truck loading and unloading, storing goods and materials ceiling high, handling skids and pallets with the same lift truck, many other applications. Barrett-Cravens Co.

394 Lift Truck Work Kit—A method of predetermining the time necessary for fork lift trucks to perform specific operations is provided in this work kit, designed to enable plant engineers to apply fork lift truck standard performance data. It can assist in determining efficiency of fork lift trucks now in use as well as in planning for future needs. Includes typical materials handling examples to show technique for application of the data, as well as charts providing times for basic truck motion elements. The Yale & Towne Mfg. Co.

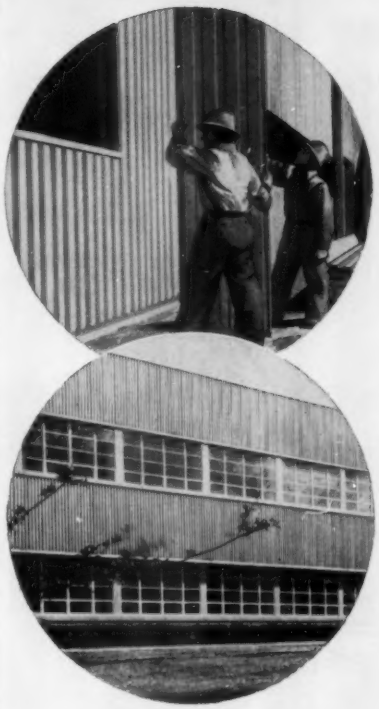
395 For Heavy Moving—How Mighty Movers solve heavy moving problems with economy, safety and speed is detailed in this illustrated folder. Lists various applications and includes specifications. Mighty Mover Co.

396 Electric Freight Elevator—Bulletin A-414, 12 pp, contains design and operation information on company's plunger electric freight elevator designed for low-rise, light and heavy duty freight handling requirements. A sectional diagram points out component parts, and an installation diagram and size and capacity table are included. Otis Elevator Co.

397 Sheet Lifter—Operational and design features of company's sheet lifting equipment, which contributes toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

398 Oil-Hydraulic Lifts — Catalog RE-203, 20-pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank for powering oil-hydraulic devices. Illustrates lift platforms, platform accessories and safety devices, jacks, power units. Rotary Lift Co.

Read about Q-Panels



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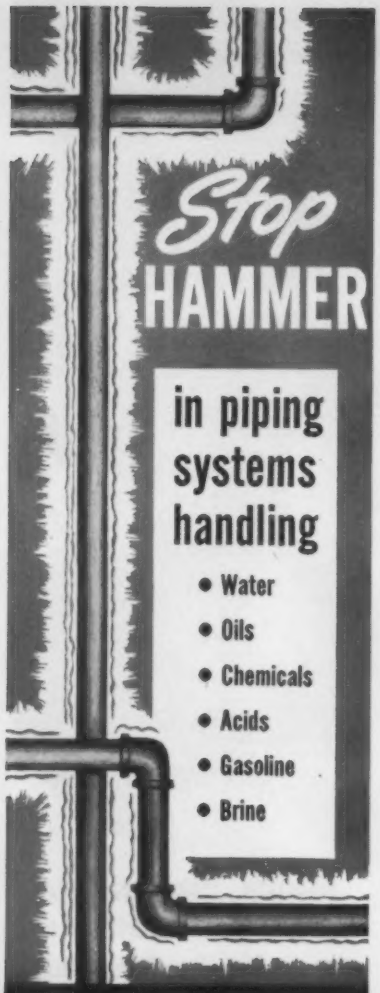

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(Begins on page 231)

399 **Adjustable Ramps**—Engineering details and other information on use and installation of company's hydraulic adjustable ramps for loading docks are featured in this illustrated bulletin. Two types of dock equipment are treated—the Adjust-A-Dock, installed in the loading platform or at its level, and the Adjust-A-Truck, installed at ground level to raise or lower rear wheels of truck. Rowe Methods, Inc.

400 **Shock Absorbing Casters** — Twenty-pp Catalog FH-53 describes construction features of company's Floating-Hub casters, listing types and mountings now available. Load ratings for each type and size are provided. Stresses, by text and illustration, how these shock absorbing casters work, permit smooth travel over rough floors. The Bassick Co.

401 **For Hopper Economy**—"In Dollars and Sense" explains long run economy of company's self-dumping hoppers showing how they operate and telling how they fit particular plant requirements. Illustrated with photos, gives dimensions, weight of a standard 1-yd model. Roura Iron Works.

402 **Railroad Car Spotter**—Book 2092 describes a car spotter with which one man can easily spot six loaded railroad cars at one time —or handle scores of other tasks involving horizontal haulage in either direction or around corners. This spotter consists of a vertical capstan, helical and worm gear drive, housing and integral motor. Engineering information, instructions for calculating rope pulls and typical layouts for both car spotters and car pullers are provided. Link-Belt Co.

STORAGE EQUIPMENT

403 **Storage Equipment**—Catalog 100-E, 72-pp, illustrates and describes company's complete line of steel cabinets, folding chairs, chests and safes, stools, tool boxes, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and other specifications. Photos illustrate some typical equipment installations. Lyon Metal Products, Inc.

404 **Adjustable Shelving**—How this shelving can save assembly time is explained in 28-pp Form 2111. Photos and drawings of various types of shelving units, including open and closed shelving, bin units, ledge shelving, counter shelving, cabinets with swinging and sliding doors, parts and accessories, are included, along with specifications. Standard Pressed Steel Co.

ELECTRICAL

406 **Variable Speed Motors**—Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls; etc. U. S. Electrical Motors, Inc.

407 **Motor Buying Guide** — Bulletin GEC-1026, 28-pp, features company's standard a-c fractional and integral horsepower motors in most general use. Included are general- and definite-purpose, fractional horsepower motors, and fhp gear motors. A section on selection of integral horsepower motors covers horsepower requirements, enclosures, starting current limitations, speeds, motor types, and selection of fuses and circuit breakers. Descriptions and specifications cover single-phase, polyphase, totally enclosed fan cooled, and gear-type integral horsepower motors. Photos, ratings, dimensions, weights, frame numbers, and modifications included. General Electric Co.

408 **Polyphase Motors** — Bulletin 103 provides design features of company's Loadstar polyphase motors conforming to new NEMA standards and also gives tabulated information on the changeover. Open drip-proof and totally enclosed fan cooled motors are covered. Photos show construction details. Leland Electric Co.

409 **Motors**—General specifications for company's open drip-proof motors and splash-proof motors, and enclosed motors are contained in 8-pp Bulletin 800. Includes data on construction features, electrical specifications,

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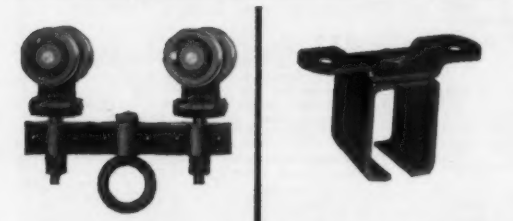

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4-WHEEL
for easy cutting in tight places

RIGID
Work-Saver Pipe Tools

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Used as metering pumps, Vikings deliver fluid into the mixing tank of the unit, where it is properly blended with the correct amount of sand for hydraulic oil well fracturing service. It is the first practical design for such work and is made possible by accurate Viking pumping. From one to four Viking 450 G.P.M. at 260 R.P.M. pumps are used with Halliburton equipment.

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THE ORIGINAL "*GEAR-WITHIN-A-GEAR*" ROTARY PUMP

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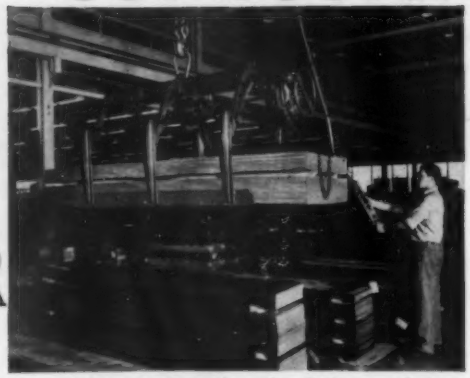

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DATA FILE

(Begins on page 231)

dimensions, mounting dimensions, as well as dimensional diagrams. Brook Motor Corp.

410 **Motors, Brakes, Transformers**—Bulletin G-55-2, 8-pp, outlines advantages of company's line of motors, brakes and transformers. Describes applications, construction features, and lists rating data. Wagner Electric Corp.

411 **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual starters. Lists applications for them. Square D Co.

412 **Testing Instruments** — Bulletin 19-56, 16-pp, features company's electrical testing instruments, including ohmmeters, ground testers, dielectric test sets, motor rotation tester, cable fault locating equipment, transformer turn ratio test sets, corona test equipment, frequency meters, tachometers, others. Includes photos and descriptions of each type, including chief features, operating ranges, and suggested applications for them. James G. Biddle Co.

413 **Enclosed Switches**—Catalog 83, 28-pp, describes in detail enclosed switches for industrial applications. Included are general switches designed for use on either a-c or d-c purpose switches, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements and electrical ratings. Photos, dimensional drawings, circuit diagrams, electrical data are included. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

415 **Commutator Slip Ring Maintenance**—This practical little 40-pp handbook gives procedures and methods for commutator and slip ring maintenance. Generously illustrated with photos and sketches, booklet contains sections devoted to common troubles and their corrections; brushes; general maintenance; and company's products for maintenance of commutators and slip rings. Defines commutator terminology. Ideal Industries, Inc.

417 **Panel Components**—Bulletin EE-120 is a 54-pp panel builders handbook of electrical components, containing specifications, diagrams, dimensions, photos and price lists of company's motor control. Profusely illustrated with photos, dimensional and wiring diagrams, bulletin covers manual starters, relays and contactors, magnetic starters in non-reversing, reversing, and multi-speed types, and a group of accessories which include thermal overload relays, oil tight pushbutton units, limit switches, timing devices, solenoids, electrical interlocks, and solenoid-operated brakes. Cutler-Hammer, Inc.

418 **Electrical Conduit**—This 8-pp bulletin, Form 646, describes company's heavy-duty, rigid steel electrical conduit, reproducing test data sheets to show how the protected conduit stands up under corrosive attacks of salt spray, sulfuric acid, caustic soda, and exposure to excessive heat. Four-color photos illustrate the effects on this and other conduit after exposure to attacks listed above. National Electric Products Corp.

420 **Wire and Cable**—Bulletin 1096, 16-pp contains detailed information on electrical wire and cable, as well as insulation and protective covering. Two selection charts—one by application and environment and one by cable type—are a practical guide to selection of best cable for a particular application. Minimum standard industry specifications are listed. Trade names, products and applications are also given. The Okonite Co.

421 **Aluminum Condulets** — Bulletin 2681, 24-pp, lists copper-aluminum condulets designed to resist the corrosive action of many chemicals in highly corrosive locations. A pictorial index and price list cover the various types available. Crouse-Hinds Co.

422 **Battery Manual**—Battery selection techniques are emphasized in 20-pp Bulletin 210, a revised edition of this manufacturer's manual on storage batteries for stand-by power, emergency lighting and switchgear applications. A discussion of charging equipment and simplified battery maintenance procedures is included. Storage battery installation procedures are described and illustrated by photos. Exide Industrial Div., The Electric Storage Battery Co.

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Faulty firing wastes dollars in smoke — and local ordinances are growing teeth as the smoke nuisance increases. It will pay you to send NOW for your free copy of Bulletin CM-22 that gives details of the new Fireye System FE-3.

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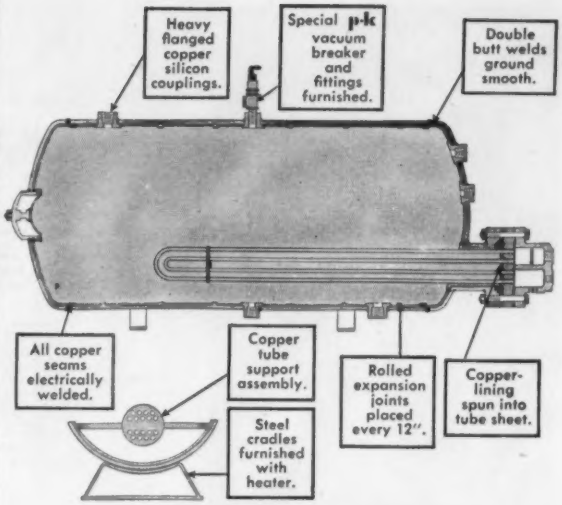
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DATA FILE

(Begins on page 231)

423 **Handbook on Storage Batteries**—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

424 **Motive Power Batteries** — This 48-pp general service manual on lead acid batteries for all types of motive power application is a practical guide to industrial cycle service, including industrial truck, air conditioning, and others. Includes photos, charts, tables, methods of repair, maintenance and theory of operation, instructions covering repairs with regular or special tools, simplified testing methods including safety practices, acid handling precautions, and charging methods. C & D Batteries, Inc.

425 **Flexible Cords** — This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

LIGHTING, COMMUNICATIONS

426 **Fluorescent Lighting**—This 24-pp fluorescent lighting guide book is a reference digest on fluorescent products. Gives advantages of this type of lighting; summarizes various lamps and parts, including starter sockets, lampholders. Includes reference chart for lamp performance when interchanged with typical ballasts. Sylvania Electric Products Inc.

427 **Guide to Luminaires** — Pocket-size, 28-pp Bulletin B-5799-BB covers fluorescent luminaires for industrial and other use. Summarizes salient features of each type of luminaire as it discusses electrical characteristics, maintenance and mounting data, details of construction, dimensions, and recommendations for application. Also contains a pictorial guide to floodlights and incandescent luminaires for industrial and other use. A 4-pp tabulation of buying data concentrates information needed for procurement. Westinghouse Electric Corp.

428 **How to Use Sound Signals**—This 44-pp combination manual, data book and catalog is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a code signal call system. Benjamin Electric Mfg. Co.

429 **Signal Equipment** — Tips on how to select suitable signals for any specific operation are offered in one of a series of bulletins—Nos. 100-125—bound in this 40-pp catalog. Other bulletins describe horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics and other data included. Federal Sign & Signal Corp.

430 **Sound Measurement**—Form 797-C, 12-pp, outlines the many applications of sound and vibration measuring instruments and describes several models of sound level meters designed for measuring intensity of sound and analyzing its various frequency components. Includes specifications and full descriptions of the models, along with photos of the instruments in use and data on various accessories. General Radio Co.

PUMPS, COMPRESSORS

431 **For Hazardous Liquids**—Catalog Section D, 12 pp, presents company's line of Underwriter rotary pumps for hazardous liquids. Both mechanical seal and deep stuffing box models are shown and dimensions and specifications provided. Various mounting arrangements and drives available for these UL approved

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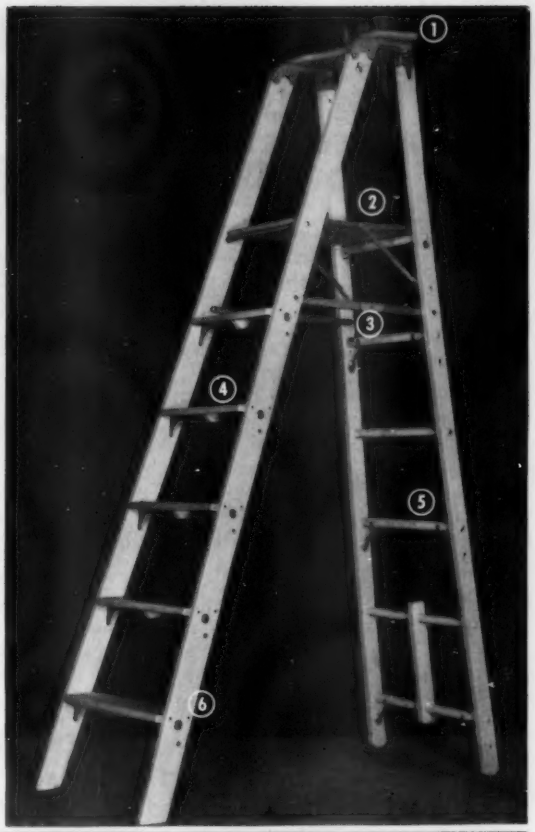

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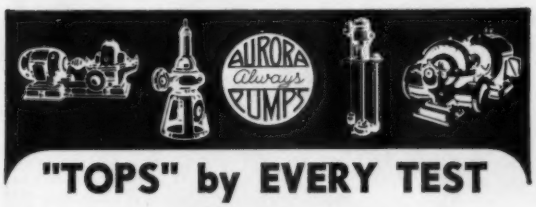

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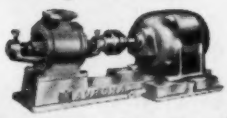

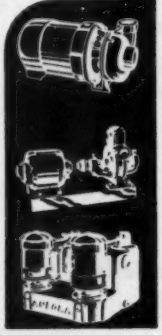

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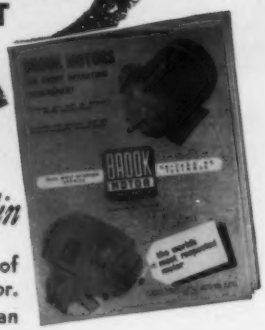

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DATA FILE

(Begins on page 231)

pumps are also cataloged, and application suggestions are given. Also in this booklet are performance graphs. Viking Pump Co.

433 **Condensed Pump Data** — Form 4383-J covers more than 20 types of general service pumps, rotatry pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high-pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications and features. Goulds Pumps, Inc.

434 **High Vacuum Pumps** — Catalog 400 describes company's mechanical booster high vacuum pumps. Points out advantages of two-stage construction, and illustrates characteristics in metallurgical vacuum processing, metallized coating, foundry research and pharmaceutical applications. A cutaway view is included, together with performance curves which show typical pumping speed, other data, horsepower vs. inlet pressure. Kinney Mfg. Div., The New York Air Brake Co.

435 **Hand Pumps**—Double action, piston-type and pumps of 20-gpm capacity are described and illustrated in Bulletin 3011. Design and construction details are provided and applications suggested. Also provided are specifications and data on fittings. Bowser, Inc.

436 **Data on Pumps**—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

437 **Compressor Data** — Feather valve compressors from 75 to 350 hp are described in 32-pp Bulletin L-676-B1A. Advantages on installation, operation and maintenance costs are outlined for types YC and DYC compressors. Information and illustrations are offered on component parts, including frame, running gear parts, intercooler, crosshead, motor and main bearings and various cut-away views are included. Variable capacity control information is listed along with data on governors. Diagram illustrates correct selection and coordination of auxiliary equipment. Worthington Corp.

438 **Compressors** — Bulletin A72, 36 pp, gives construction, operation information on company's Class WN-114 heavy-duty air compressors. Illustrates seven models of compressor as a single unit for displacement capacities from 1186 to 1948 cfm, twin units furnishing up to 3896 cfm. Joy Mfg. Co.

439 **Portable Compressors**—Twelve-pp Catalog GG-9A pictures 40 models of company's portable type compressors. A quick reference chart shows capacities, engine types, and mountings available. Illustrates such features as: replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines, and magneto ignition on all gasoline models. Le Roi Div., Westinghouse Air Brake Co.

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In pellet manufacture, excess dust is removed from the dies while they revolve. Lint is taken from cloth goods on the move and valuable metal scrap is reclaimed at the tool or from the finished units while on the production line. These and more than a hundred special applications for industry are described in Bulletin 144.

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DATA FILE

(Begins on page 231)

440 **Gas-Engine Driven Compressors** — A two-cycle turbocharged compressor is described in 24-pp Bulletin 134. Stresses economy of installation and operation afforded by this gas-engine driven unit, lists other advantages. Explains how turbocharging saves on fuel and cooling. Design and construction features are discussed. Clark Bros. Co.

441 **For On-the-Spot Air** — Eight-pp Form 2302 features company's self-contained Spot-Air portable compressor. Deals with the many tools it will operate, with actual on-the-job illustrations pointing out added advantages of this light-weight compressor on jobs where bigger compressors are not needed. Ingersoll-Rand Co.

PACKINGS AND SEALS

442 **Buyer's Guide on Packing**—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons and inside-packed piston pumps. Greene, Tweed & Co.

443 **Mechanical Seals** — Bulletin AD-150, 8 pp, features complete data on Type BB-21A Mechanipak seal. Tells how it works and illustrates operation and design features with cutaway drawings. Typical applications are listed and specifications are tabulated. The Garlock Packing Co.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

444 **Portable Electric Tools** — This 1955 Standard Catalog, Form 10, 24 pp, features company's line of portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners, and others. Photos and full specifications included. The Black & Decker Mfg. Co.

445 **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Standard Oil Co. (Ind.)

446 **Pipe Tool Ordering Guide**—Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

447 **On Spot Welding**—"Spot Welding from One Side—With a Portable Gun," 12-pp, describes an inert-gas-shielded tungsten-arc spot welding process. Over 30 tables, weld cross-section and application photos, drawings and graphs are included. Sections of text cover when to consider spot welding from one side, how the equipment operates, standards and test procedures, factors affecting weld. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

448 **Where to Use Your Stud Driver**—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

BOILERS, GENERATORS

449 **Packaged Boilers**—This 16-pp illustrated catalog describes manufacturer's new Type VP Package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 40,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

450 **Steel Boilers**—Revised General Catalog 80, 32-pp, is a condensed but complete product guide on company's high and low pressure steel boilers. Also included are full descriptions and illustrations of water heating products, both direct fired and storage types as well as indirect water heating coils. Pages on boiler support brackets, structural steel suspension and induced draft fans, as well as pictures of installations are included. Kewanee-Ross Corp.

451 **Automatic Boilers**—Bulletin BE-4 describes operation and advantages of Continental automatic boiler's spinning gas technique—a method of obtaining maximum heat transfer with a simplified design. Shows cutaway view of boiler construction; illustrates hinged doors and method of injecting air through static, turbine-like vanes into burner. Boiler Engineering & Supply Co., Inc.

452 **Automatic Boilers**—Advantages of company's packaged automatic boilers for light oil, heavy oil, gas or combination gas-oil firing are outlined in Bulletin 1220. Describes two models, and includes ratings, dimensions and weights, as well as installation photos. Orr & Sembower, Inc.

453 **Steel Boilers**—Revised General Catalog 80, 32-pp, is a condensed but complete product guide on company's high and low pressure steel boilers. Also included are full descriptions and illustrations of water heating products, both direct fired and storage types as well as indirect water heating coils. Pages on boiler support brackets, structural steel suspension and induced draft fans, as well as pictures of installations are included. Kewanee-Ross Corp.

454 **Package Boilers**—This 12-pp booklet on package steam generators describes the formulas behind all package steam generators, and illustrates how installation of a package steam generator can raise steam capacity in an existing boiler room without extensive structural changes. Shows plant operators how to make survey of their own steam requirements. Cyclotherm Div., National-U. S. Radiator Corp.

455 **Packaged Generators**—This 16-pp catalog covers a new series of packaged steam

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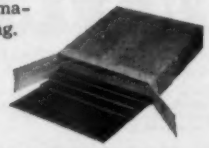

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(Begins on page 231)

generators in sizes from 10,000 to 46,000 lb of steam per hour. Gives capacities, dimensions, construction features. Instrumentation is discussed. Illustrations include sectional drawings and installation photos. Booklet also provides a selection chart on firing equipment and controls. Foster Wheeler Corp.

SPACE, PROCESS HEATING

456 **Unit Heaters**—Bulletin 7517, 48 pp, presents full information on latest design of this company's Venturafin unit heaters for steam or hot water applications. Gives features of construction, general engineering data, capacity tables. Fully illustrated with photos of horizontal and vertical models, dimensional drawings and piping diagrams, booklet includes tips on the use and selection of unit heaters. American Blower Corp.

457 **Plumbing, Heating Supplies**—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

458 **Forced Air Space Heaters**—Illustrated Bulletin 523-B, 12-pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principles and flexibility of application. Advantages of the heater are detailed. Dravo Corp.

459 **Electric Heat, 101 Ways**—Principal industrial heating applications and methods are described in "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed along with a discussion of the problem, solution and advantages obtained. To illustrate liquid heating, diagrams and photos show best applications for the elements and heaters. Similar treatment is accorded problems of heating air and gases; melting soft metals and viscous materials; and heating machinery and equipment parts. A section is devoted to far-infrared heating. Edwin L. Wiegand Co.

460 **Engineering Data for Heating Systems**—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

461 **Hot Water for Industry**—An excellent engineering data booklet, "Hot Water for Industrial Plants," is a compilation of literature covering use of water heaters for process needs, cafeterias, lavatories, wash fountains, laboratories. Discusses hot water requirements for these applications; describes and illustrates heaters, recovery systems, booster units applicable; provides installation suggestions and operating instructions. Available to qualified plant engineers, please state your title. A. O. Smith Corp.

462 **Unit Heaters** — Catalog 155, 32 pp, presents unit heaters for steam and hot water in vertical and horizontal delivery and power-throw types. Covers design features and provides performance and capacity data. Also provides information on unit heater selection, sound ratings, locating unit heaters, motor wiring and control. Piping and installation suggestions are included as well as typical unit heater specifications. Modine Mfg. Co.

463 **Industrial Ovens** — Thirteen types of company's Conventioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers. The W. W. Sly Mfg. Co.

464 **Hot Water Heating Systems**—Catalog GK-954, 24 pp, features a complete line of equipment for forced hot water heating systems and chilled water cooling systems. Nine pages are devoted to information on a complete line of circulating pumps for dozens of applications. All-bronze pumps for circulating service water and silent operating centrifugal pumps for boosting water pressure are a few of the new applications. Valves, fittings, air vents, air tanks and water heaters are also described in detail. Bell & Gossett Co.

465 **Industrial Ovens** — Engineering, manufacturing and installation of processing ovens are described in Bulletin D-53-20, 16 pp. Covers oven types, application to industry source of heat, selection of heater, control of heat, distribution of heat. Photos show typical oven installations, and a complete modern finishing process is presented. Newcomb-Detroit Co.

SYNTHETICS

466 **Nylon For Maintenance**—Nylon as a maintenance material for mechanical, chemical and electrical applications is described in this illustrated folder. Advantages are given, and specific uses listed along with a lineup of material's maintenance properties. Stock shapes and sizes are shown and finished parts illustrated. Tips on machining are offered. The Polymer Corp. of Pennsylvania.

467 **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Elastomers Div., E. I. du Pont de Nemours & Co.

468 **Synthetic Fluids, Lubricants** — Form F-6500D, 52-pp, on synthetics, covers properties, applications, and characteristics of these polyalkylene-glycol derivatives. Describes uses as mechanical lubricants, hydraulic fluids, rubber and textile lubricants, heat-transfer fluids, antifoam agents, solvents, and formulation components. Engineering data is presented in the form of tables and charts, and application photos included. Carbide and Carbon Chemicals Co., Div., Union Carbide and Carbon Corp.

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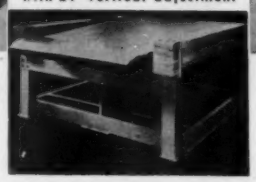

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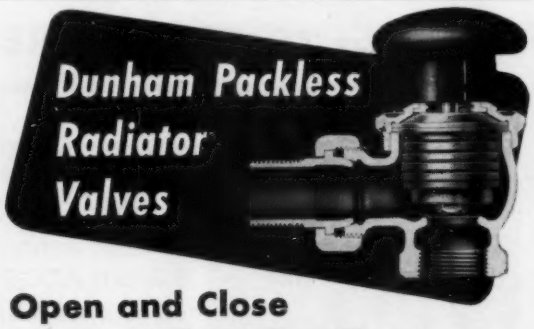

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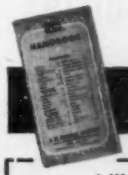

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(Begins on page 231)

469 **Overheat Protection**—Bulletin MOPR-1, 8 pp, describes design and operation features of inherent overheat protectors—small devices built into electric motors to turn power off when windings get too hot. Includes photos and wiring diagrams illustrating operation. Metals & Controls Corp.

471 **Wire Rope Assemblies** — Catalog 5201, 22-pp, describes company's wire rope assemblies, used for operating controls, as a part of machinery and equipment, or for slings and hoists. Gives general applications for various types of wire rope assemblies, and includes specifications, ordering details. Macwhyte Co.

472 **Filters, Strainers** — Industrial Catalog 1054, 48 pp, provides application and engineering information on company's line of micro-filters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are presented along with construction details, performance data, and specifications. Purolator Products, Inc.

474 **Selector Charts** — Bulletin CE-50, 20 pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; rubber-lined tanks. American Hard Rubber Co.

475 **Production Control System, Procedures** —Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production lines. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

476 **Fighting Corrosion With Corrosion** — Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures, cathodic protection battery, and includes design and application data. Electro Rust-Proofing Corp.

477 **Finishing Systems**—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamel, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors. The R. C. Mahon Co.

478 **Economy of LP Gas**—"The Aircraft Story," 8 pp, gives the report of a test made at one aircraft company, and results which another aircraft company obtained after converting their fleet of internal plant trucks to LP gas operation. Explains advantages of LP gas as an engine fuel and steps necessary in conversion of equipment to LP gas operation. American Liquid Gas Corp.

479 **After Cooler**—Bulletin 130, 8 pp, explains functions of company's Aero after cooler in removing moisture from compressed air and gas. The apparatus is described and illustrated with diagrams and photos. Included also are diagrams and illustrations of applications in liquefication systems. Bulletin also illustrates other types of air engineering equipment produced by manufacturer. Niagara Blower Co.

480 **Humidification for Profit**—Bulletin 500, 16 pp, includes physical data and prices on electrically controlled and air operated humidifiers. Handbook section explains how relative humidity affects hygroscopic materials, static electricity, health and comfort. Photos show installations and several pages are devoted to selection and installation tips. Many helpful tables included. Armstrong Machine Works.

481 **Washroom Advisory Service** — Form 1367, 34 pp, is an illustrated brochure describing company's washroom advisory service aimed to help in planning of well-designed, easily maintained and properly equipped personal service rooms. Describes basic washroom facilities, combination locker, shower and washrooms, and combination lounge, powder and washrooms. It also features washroom fixtures and towel and tissue supplies. Scott Paper Co.

483 **Ductile Iron**—Cast iron that can be bent is described in this 28-pp revised edition, with tables, charts and photos. Photos show applications of ductile iron castings, and bulletin lists typical applications in various industrial fields. The International Nickel Co., Inc.

484 **For Lining Vessels** — Bulletin 1012 gives details on a formula for lining steel vessels on the job and greatly extending their service life. Tells how to prepare and apply this inexpensive lining, includes data on coverage. Pocono Fabricators, Inc., Div., The Patterson-Kelley Co., Inc.

485 **Filter Fabric Facts** — This 16-pp illustrated booklet contains information about filtration principles; filtering devices; filter media; textile fabrics for filtration; a comprehensive chart on chemical and heat resistance of cotton and synthetic fabrics; sections on yarns, fabrics construction and finishing; and a round-up of filter fabrics in use. Photos illustrate variety of filter fabrics being produced for industrial use. Wellington Sears Co.

486 **Swivel Joints**—Catalog G-4, 32 pp, covers this manufacturer's line of ball-bearing swivel joints as well as other products including loading racks, manifolding lines, all-metal hose. In addition to providing dimensional and operating data on these products, this booklet is generously illustrated. Chiksan Co.

487 **Rigid Plastic Material**—The advantages, uses and available forms of Bolatron 6200 are presented in this catalog, about 14 pp. Gives dimensional data, tolerances, weights for sheet, bar stock, pipe, fittings and valves made of this unplasticized polyvinyl chloride. Includes thermal, electrical and mechanical properties, also detailed information on chemical resistance. H. N. Hartwell & Son, Inc.

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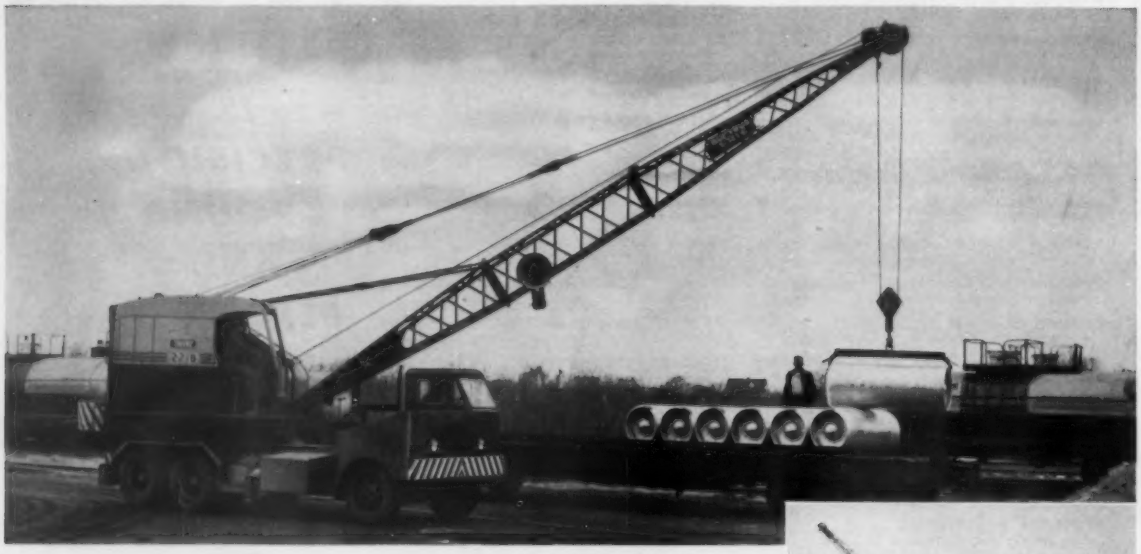
Whether you are handling materials in widely scattered locations, over difficult terrain, or in close quarters, there is a Bucyrus-Erie 22-B crane which will do an outstanding job of handling your particular situation. Each has the power, long reach, and solid construction that help you save money through efficient, long-term service. 253E56



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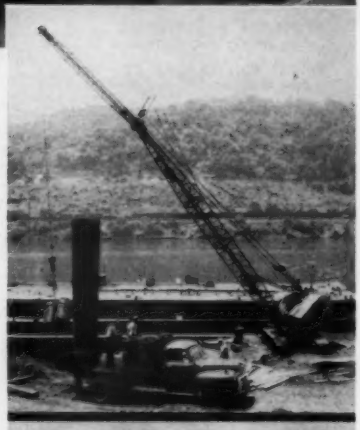
Combining heavy-duty lifting crane features with rubber-tired mobility, the 22-B Transit Crane handles booms from 30 feet (standard) to 80 feet (with removable inserts), has lifting capacity of 25 tons. Job-to-job moves are fast and convenient.



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HEAVY-DUTY 22-B CRANE

An outstanding performer wherever extra strength and stability are vital, the Heavy-Duty 22-B has high maneuverability on rough or soft terrain. It is equipped with a 35-ft. boom, extendible to 70 feet through use of inserts. Long, flat crawlers with 30-in. treads, friction swing brake, power controlled lowering for the main hoist line, and telescopic pipe boom stops are only a few of its many features.

General Service

22-B CRANE

For a variety of jobs requiring highly dependable service, the standard 22-B crane can't be topped. Carrying a 35-ft. boom extendible to 70 feet, this machine has high maneuverability and great stability as well as independent power boom hoist and many other features you ordinarily find as optional equipment on other cranes.

For complete information on any one or all of these models, see your local Bucyrus-Erie distributor or write direct.

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

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Low cost, permanent, washable type for locations where highly efficient filtration is not required. Large dust-holding capacity with amazingly low resistance to air flow. Unsurpassed for ease of cleaning. Ask for Bulletin 700.

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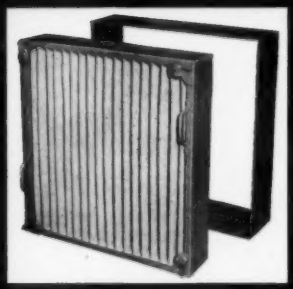
Highly efficient for heavy duty Ventilation work. Operates with any filtering medium that comes in sheet form and can be crimped. Preformed media can be inserted quickly and easily when required. Ask for Bulletin 600.



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Highly efficient—removes 90% of all air-borne dirt, including smoke, dust, pollen, oil mist. Ionizer and Collector in one unit. Available in single unit of 1200 and 1800 CFM; any capacity in multiple units. Ask for Bulletin 400.

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Provides self-contained ventilating system for individual machine tools. Removes air contaminated with oil, smoke, grit, and chips and returns clean air to shop. Saves you hundreds of dollars in building maintenance expense and lost man-hours due to employee sickness. Ask for Bulletin 420.

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Whatever your filtering problem, wherever you are, there's a Dollinger representative ready to help you solve it with a *Staynew* filter—the *only* complete line of industrial and ventilating filters available.

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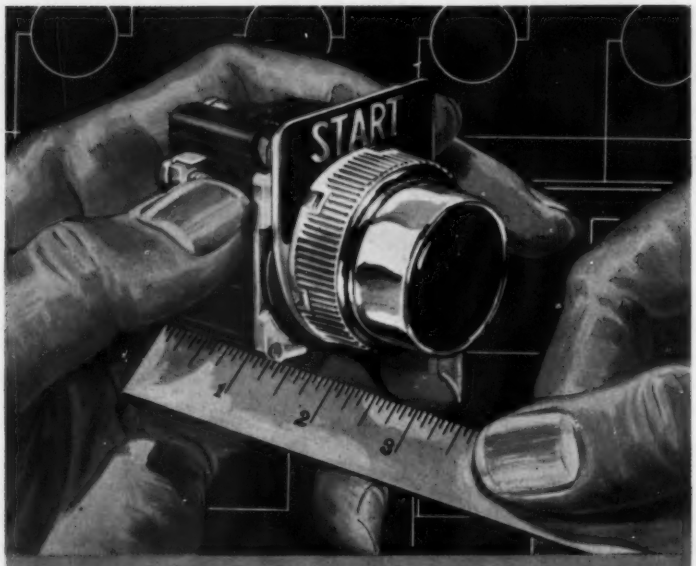
Now...for machinery designers...new heavy duty pushbutton units built to the standards of the spectacular new Cutler-Hammer Three-Star Motor Control



These are the world's smallest heavy duty pushbuttons. They require a behind-the-panel depth of only 1 3/32". This is 40% less space than needed by the next smallest units on the market. Double-pole contact blocks are available in all combinations of normally open and normally closed contacts. Each control circuit is electrically and mechanically isolated from the other. Each circuit is clearly identified and all terminals are color coded. Rapid on-the-job circuit additions are obtained by stacking contact block on contact block.

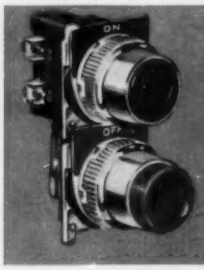
☆ *they install easier*

☆ *they work better*

☆ *they last longer*

Design engineers are quick to recognize that these new heavy duty pushbuttons have *everything*. There is nothing on the market like them. They are amazingly compact to require the least back-of-panel depth. They are one-hole mounting and they are oil tight. They easily provide for as many as eight separate control circuits per pushbutton, eight completely isolated heavy duty contacts either normally open or normally closed. The buttons may be flush type, the extended type or with mushroom heads. They can be black, red, yellow, green or gray. See the new one-button control station, C-H Roto-Push. See the easiest-to-install maintained-contact pushbutton attachment and the means for padlocking any of the standard pushbuttons. There are both knob and key operated selector switches in this complete line. Also matching indicating lights and the new automation safety light, PresTest. Be sure you have complete information *now*. Write today on your company letterhead for a copy of the new Cutler-Hammer Panel Builders Handbook Pub. EE-120. CUTLER-HAMMER, Inc., 1447 St. Paul Ave., Milwaukee 1, Wisconsin.

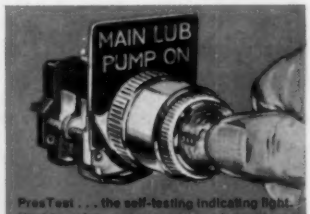
These pushbuttons may be flush type, extended type or with mushroom heads . . . in a wide range of colors for quick control identification. Standard, large, and jumbo size legend plates fit every type of operator and indicating light in the entire line.



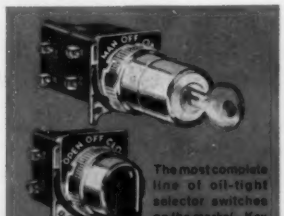
A maintained-contact pushbutton assembly that saves more than its entire cost by installation savings. New attachment with its pushbuttons mount in minutes; no fussy adjustments. Neither alignment nor spacing of units is critical. Pushbuttons will not bind or stick; always operate perfectly.

CUTLER-HAMMER
☆ ☆ ☆
MOTOR CONTROL
C-H

The C-H one-hole mounting oil-tight indicating lights with new wide-visibility lenses are the most visible from all angles by actual light meter tests. Available in either transformer or resistor types. Lenses offered in six different colors.



PresTest . . . the self-testing indicating light. Vital to safety and proper use of machines, particularly in automation. PresTest now permits instant proof light is NOT off because of burned-out bulb. Merely pressing on the light lens disconnects bulb from its normal circuit and checks it on a test power supply. Resistor and transformer types available.



The most complete line of oil-tight selector switches on the market. Key or knob operated; two or three position. Positions may maintain contact or have spring return. Three standard contact blocks provide a wide range of circuit combinations with the use of just a single block. Unlimited circuitry by adding blocks.

Roto-Push . . . the one-button control station. One Roto-Push can provide all the control functions for which two or three separate pushbuttons would be used normally. Available in a wide range of selector and button operators. Roto-Push simplifies panel design and saves installation time to cut costs, improves machine-operator efficiency.

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JULY, 1956

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The magazine that helps plant engineers with their everyday problems